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⑤④ **Printing form stretching device in a printer.**

⑤⑦ A printing form stretching device in a printer secures the form stretching in the direction of the printing line and next to this one. The device comprises cone-shaped pressure rollers of resilient material with high friction coefficient which press the printing form next to the edges against a platen.

The pressure roller axis is parallel to the platen and the roller taper is turned towards the central zone of the form.

The roller buckle causes a form transversal stretching in the direction of the printing line and prevents transversal movements of the form.

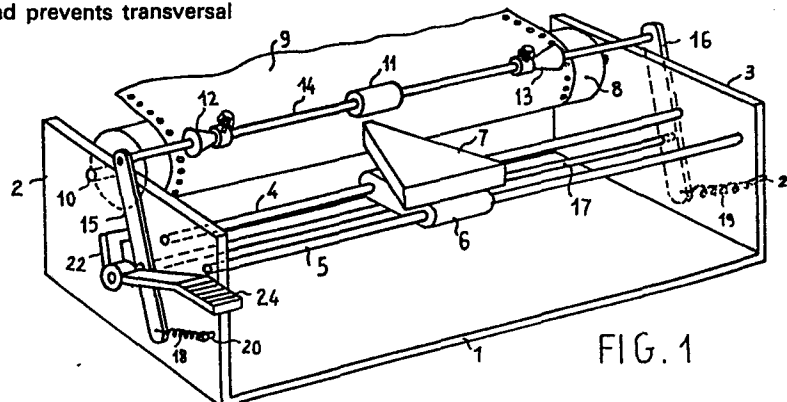


FIG. 1

Printing form stretching device in a printer

The present invention relates to a printing form stretching device in a printer.

With regard to the printers used in data processing systems, the printing form has to be suitably stretched and steadily positioned in order
5 to obtain a high printing quality.

In fact the printing is generally obtained by means of printing elements moving as to the printing form, as for instance type-bearing drums or belts in case of so-called parallel printers and printing heads movable along the printing line in case of so-called serial printers.
10

The movement of the printing element as to the printing form causes some form displacements which may be avoided only by a suitable stretching of the printing form.

Such stretching further assures the adhesion of the printing form to the printer platen.
15

This is necessary to limit the noise generated by the printing operations in case of impact printing, such noise being widely due to the printing form vibrations caused by the printing elements.

The wider such vibrations are, the less the stretching and the adhesion to the platen of the printing form are.
20

In the prior art the printing form stretching is only provided along the form feed direction (that is the direction transversal to the printing line) by means of feeding devices such as pin tractors, pinwheels,

friction feeding rollers.

Other solutions are for instance described in U.S. Patents Number 3,746,142 and N. 3,917,048.

But all these devices are not able to provide a printing form stretching along the printing line direction.

This involves that in a lot of printers undesired transversal displacements of the form may occur during the printing operations.

Such displacements, although minimum, are prejudicial to the printing quality.

10 In fact they cause misalignments of the printed types.

Besides, in case of mosaic serial printers for high quality letters where the printing is obtained by subsequent passes of a printing head along a printing line, the form displacements cause misalignments of the printing dots within a same letter.

15 Considering that in such mosaic serial printers the step among dots is of about 0,15 mm, it is clear that even a minimum displacement of the same width of the printing form is seriously prejudicial to the printing quality.

The device object of the present invention overcomes such inconvenient and secures a suitable stretching of the printing form along the longitudinal direction.

In such way, by combining the device of the invention with the feeding and stretching devices of the prior art, it is possible to stretch the printing form both vertically and longitudinally.

25 The device of the present invention achieves the longitudinal stretching of the form by means of elastical pressure rollers mounted on one or more supporting bars.

One or more pressure rollers, arranged next to the central zone of the printing form and of conventional cylindrical shape, press the form against the printer platen.

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One or more pressure rollers, arranged next to each of the printing form edges and of conical shape, besides pressing the form against the platen, apply on the form edges some longitudinal forces which stretch the form so assuring both a suitable longitudinal stretching

5 along the printing line and a perfect contact with the platen.

In this way any possibility of longitudinal displacement of the printing form is prevented and any consequent printing misalignment risk is avoided.

These and other features of the present invention will appear more
10 clearly from the following description of a preferred embodiment and from the enclosed drawings where:

Figure 1 shows in schematic and perspective view a serial printer provided with the stretching device object of the invention;

Figure 2 shows the section of an element of the stretching device object of the invention;
15

Figure 3 shows schematically the action performed by the element of fig. 2 on the printing form.

Figure 1 shows schematically a simplified ^{perspective} view of a printer provided with the printing form stretching device of the invention.

20 Figure 1 only shows the printer elements essential for the invention understanding.

The printer comprises a frame, a printing mechanism and a paper feeding mechanism.

The frame is for instance constituted by a base 1 and two sides 2, 3.
25 The printing mechanism is constituted by two guiding bars 4, 5 mounted between the sides and on which a printing carriage 6 slides.

A printing head 7 is mounted on a printing carriage 6.

Head 7 may be for instance of needle type; in such case the printing of the several characters is obtained with dot composition through the
30 selective excitation of the several head needles and the transversal

movement of the head and of the carriage.

The printing is performed on printing form 9 which partially winds round platen 8.

Platen 8 is mounted on a shaft 10 constrained to sides 2, 3.

5 Platen 8 may act as feeding element of the printing form.

In this case it is coupled through suitable driving gears to a motor not shown in fig. 1 and the form feed is secured by the friction existing between platen and form, such friction being generated by suitable rollers which press the form against the platen.

10 In alternative or in addition the printer may be provided with a form feed mechanism constituted by pin tractors operated by a suitable motor.

Such tractors are not described since they are already known in the art and unessential for the invention purposes.

15 The paper feeding device of the invention comprises some pressure elements 11, 12, 13 mounted on a bar 14 on which they may rotate.

Such elements are resilient (preferably of rubber with high friction coefficient) and press printing form 9 against platen 8.

20 Bar 14, parallel to printing platen 8, is arranged next to the printing line (preferably, but not necessarily, downstream such line).

Bar 14 is substained, at its ends, by two control levers 15, 16 which may rotate on a lever anchor bar 17 pivoted on sides 2, 3.

Two springs 18, 19 are hooked to the lower end of the control levers 15, 16 respectively.

25 The opposite ends of such springs are restrained to two pins 20, 21 fixed to sides 2, 3 respectively.

During the normal printing operations control levers 15, 16 press elements 11, 12, 13 against platen 8 thanks to the action of springs 18, 19.

30 Two arms (only one of which, 22, is shown in fig. 1) are shrinked on le

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ver anchor bar 17 next to control levers 15, 16.

Such arms, owing to the rotation of bar 17, allow to move elements 11, 12, 13 away from platen 8.

This is necessary for loading the printer with the printing form.

- 5 The removal of elements 11, 12, 13 may be normally provided for instance by a lever 24 coupled to arm 22.

According to the present invention the pressure and stretching resilient elements 11, 12, 13 are suitably shaped.

- 10 Particularly, element 11 is cylindrical and is arranged next to the central part of bar 14; on the contrary elements 12, 13 are truncated cone-shaped and are arranged next to the ends of bar 14 with their tapers turned towards element 11.

Figure 2 shows the cross section of pressure element 12.

Pressure element 13 is identical.

- 15 Element 12 is constituted by a coupling 25, engaged on bar 14 and provided with a cylindrical shoulder 26, and by a cylindrical bushing 27 on which a resilient roller 28, preferably of rubber and with cone-shaped external surface, is engaged.

- 20 Cylindrical shoulder 26 has a radial threaded opening where a locking screw 29, provided with knurled head, is screwed.

Bushing 27 is engaged on coupling 25 on which it is free to rotate.

The axial movements of bushing 27 (and therefore of conical roller 28) along the coupling are prevented on a side by shoulder 26 and on the other side by a ring or collar 30 housed into a coupling groove.

- 25 Coupling 25 may be locked on bar 14 in a preestablished axial position by means of locking screw 29.

By means of such artifice the pressure rollers may be axially moved so as to be arranged next to the printing form edges whatever the printing support width is.

- 30 The working of cone-shaped pressure rollers 12 and 13 and their action

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on the form is shown in fig. 3

Avoiding complex theoretical explanations, the experience shows that resilient element 28 subjects printing form 9, next to the contact zone, to a force F skew as to the form surface. Component F_1 , of such force secures a suitable contact pressure between roller 28 and printing form 9 and between printing form 9 and platen 8.

Component F_0 , tangential to the platen surface, pulls printing form 9 towards its direction.

As element 12 and 13 are arranged next to the printing edges so as to perform pull actions in opposite directions, a longitudinal stretching of the form is obtained.

The reaction exercised by the printing form on elements 12 and 13 tends to move such elements along bar 14 towards the form center; such reaction is prevented by the stiff axial restraints on the couplings as coupling 25 engaged on bar 14.

A simplified explanation of the phenomenon may be obtained by considering that cylindrical roller 28, next to the contact point with the printing form, buckles.

Therefore the contact point of roller 28 with the printing form moves in the direction of force F_0 .

In fact, in such direction, there is no material which prevents the buckling, whilst in the opposite one the presence of resilient material opposes to such buckling.

Owing to the friction between printing form 9 and roller 28, also such printing form follows the longitudinal movement of the contact point of roller 28.

Clearly this will occur if the friction coefficient between roller 28 and printing form 9 is higher than the friction coefficient between printing form and platen 8.

In the previous description an embodiment has been disclosed wherein

elements 11, 12, 13 are free to rotate on bar 14; therefore such elements press the printing form against the platen, and, as concerns element 12, 13, they longitudinally stretch such form.

It is however clear that a printing form stretching perpendicular to the printing line may be also obtained if elements 11, 12, 13 carry out a feeding action cooperating with the one of the platen or of the tractors.

To this purpose it is enough to have elements 11, 12, 13 shrunk on bar 14 so as to rotate with it.

10 In such case bar 14, instead to be steadily fixed to arms 15, 16, will be pivoted on these ones and will be coupled to suitable driving gears. The axial restraint of elements 11, 12, 13 will be preferably obtained with means different from the locking screw, for instance with collect chucks coaxial to bar 14 and provided with locking knurled collar.

15 Also the lever mechanism which allows to move bar 14 and elements 11, 12, 13 away from the platen is merely explanatory and may be substituted with any spring or cam bistable mechanism or with levers of different type.

Besides, if the printer is designed to print on fixed width forms, the free axial positioning of the cone-shaped elements on bar 14 is not necessary.

It is therefore clear that the above description relates to a preferred embodiment of the invention and that several changes may be made without departing from the spirit of the invention.

Claims

1. Printing form stretching device in a printer wherein some rollers of resilient material press the printing form against a platen, the axis of said rollers being parallel to the axis of said platen, characterized by that at least two of said rollers are cone-shaped and press said printing form each one next to one of the edges, the taper of said at least two rollers being turned towards the central zone of said printing form.
2. Stretching device of claim 1 characterized by that said cone-shaped rollers may be axially moved along a guiding bar and are steadily positioned on said guiding bar by means of axial restraint elements

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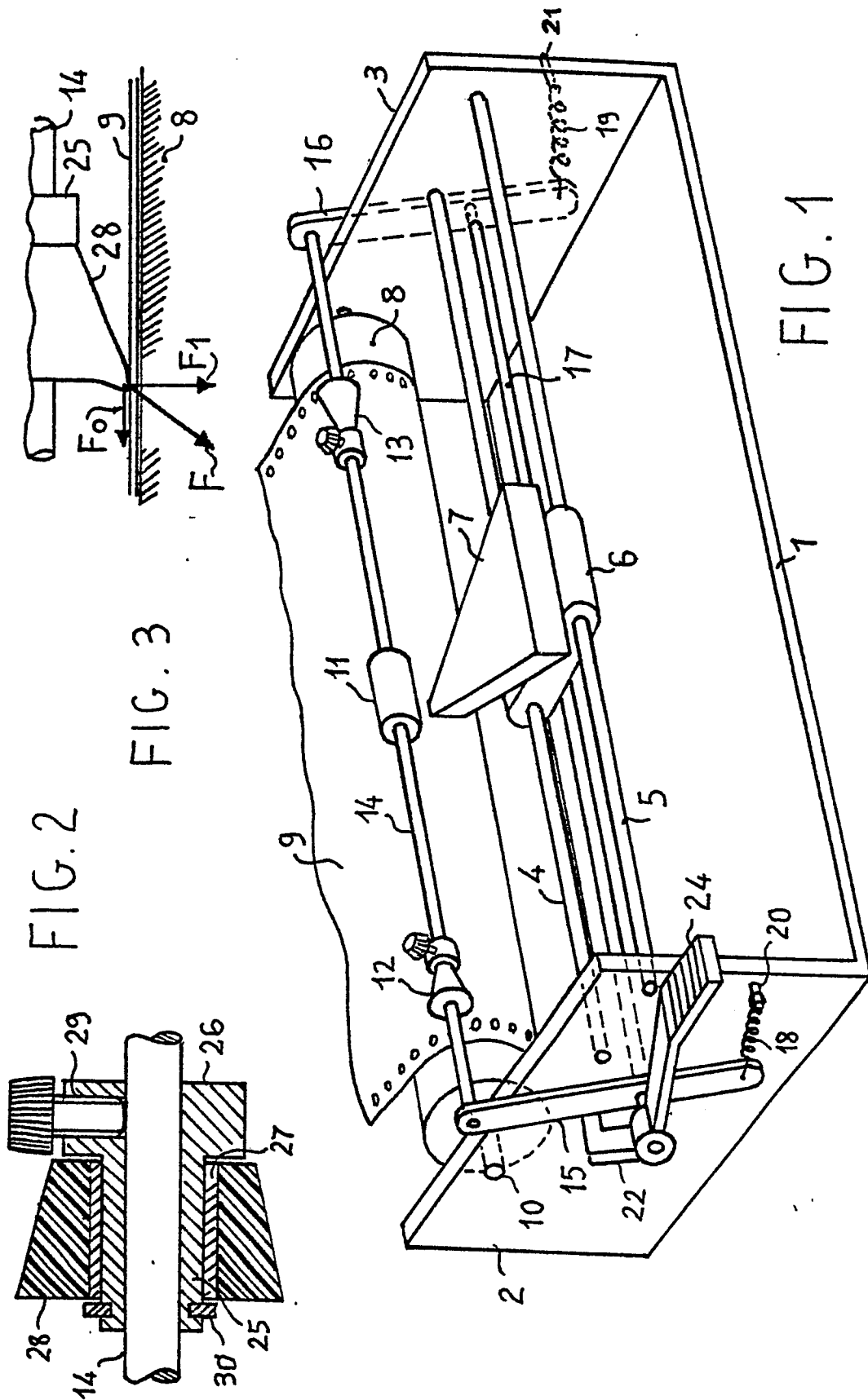


FIG. 1

FIG. 2

FIG. 3