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## (54) Paper feeding apparatus for providing a stretched paper web, starting from an unstretched condition

(57) A paper feeding apparatus for printers and the like, in particular suited for providing a continuous stretched web (3) of paper coming from an unstretched condition such as a loop (4) formed at the end of a paper processing machine placed upstream. The apparatus (1) comprises a first (6) and a second (7) dragging means placed one after the other and both pulling the web (3). The second dragging means (7) has a dragging speed V of the paper greater than 2-15% the dragging speed of the first dragging means (6) thereby a stretch occurs in the paper passing through them. The second dragging means (7) may comprise either two counter rotating friction rollers (7a, 7b) or three friction rollers (17,18,19) forming a U path. The apparatus allows to provide the printing group with a stretched web of paper without being complex and encumbrant as the presently known stretching means are.

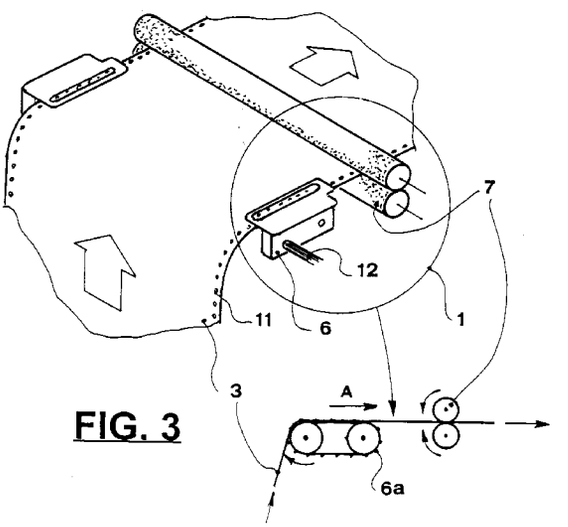


FIG. 3

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## Description

The present invention generally relates to the field of printers and other paper processing machines and more precisely it relates to a paper feeding apparatus for printers and similar machines, in particular, but not exclusively, suitable for providing a stretched continuous web of paper starting from an unstretched condition.

Most of the existing rotary printers need that the continuous paper handled is stretched.

A well-known and widely used system to stretch the paper at the entrance of a printer consists in unwinding it from a braked roll. The stretch of the paper can be registered by regulating the braking stress of the unwinding roll.

Other kinds of printers, such as data printers, use a continuous strip of paper, or web, having lateral longitudinal holes which allow it to be dragged by means of a paper dragging apparatus, also named tractor. The printing occurs inside of the printing heads, of the laser type or of the needle type, and the tractor supplies the paper to the various points of the machine by dragging it by means of rollers or belts having small teeth which engage in the holes laterally made on the paper. In this way it is possible to control the position of the paper with sufficient precision by means of encoders. In fact, the paper itself cannot slide with respect to the tractors, because the teeth stop it.

The data printers normally do not need that the paper is fed stretched, because it is sufficient that the tractor guides it, and a slight stretch is provided where this is necessary for a correct printing. Downstream from said printers means are provided for the collection of the printed paper which tear it in sheets or packages of sheets by means of tearing devices and conveying systems.

Sometimes it is possible that two processing machines are working one after the other. This happens when, for example, after the printing of the data on the continuous paper an ink printing follows via a rotary typographic printing machine capable of impressing on the paper invariable signs, such as nets or frames bordering the data, or invariable inscriptions, trademarks and coloured headings, as in the case of the printing of bills, notes, statements of account, etc.

A type of flexographic printing rotary machine which could be used in this case is described in the European Patent Application No.94115533, in the name of the same Applicant.

When the paper to be printed on a rotary machine, through which it must move stretched, comes from a machine placed upstream, the problem of stretching it arises. In fact, the paper with the data already printed on it cannot be unwound from a braked roll, because it is continuously fed from the previous machine. In addition, downstream the data printing machine, in many cases it is necessary to allow that a loop forms so as to make the upstream printing and the downstream printing independent. This need principally derives from the upstream printing machines, in which often intermittent printing phases are provided for.

In such a case, and in other similar cases, a very felt problem is to stretch the paper at the entrance of a printing typographic group. In fact, the known systems to stretch the paper at the entrance, which comes from a loop or from a condition in which it is unstretched, normally comprise very complex stretching groups which have the drawbacks of being encumbrant, very expensive and have a very complex path for the paper.

In addition, another problem arising from the known stretching system is the side tracking of the paper. In fact, it is quite difficult to prevent the paper from the side tracking as it has to follow a complex path.

It is therefore an object of the present invention to provide a paper feeding apparatus for printers and the like, in particular suited for providing a continuous stretched web of paper coming from a loop formed at the end of a paper processing machine placed upstream, or coming from an other type of condition of unstretched paper, so as to overcome the above drawbacks in a less encumbering and expensive way.

This object is achieved by the paper feeding apparatus according to the present invention whose characteristic is to comprise a first and a second dragging means placed one after the other and both pulling said web of paper coming from an unstretched condition. The second dragging means has a dragging speed of the paper greater than 2-15% the dragging speed of the first dragging means.

Preferably, the second dragging means comprises two counter rotating friction rollers. The preferred speed of the second dragging means is greater than 5% the speed of the first dragging means, thereby a stretch occurs in the paper passing through the two dragging means. Directional rolls are provided for downstream the dragging means and capable of maintaining the stretch on the paper.

Alternatively, the second dragging means comprises three friction rollers forming a U path.

Further characteristics and advantages of the paper feeding apparatus according to the present invention will be made clearer in the following description of a preferred exemplifying embodiment, but not limitative, with reference to the attached drawings wherein:

- Figure 1 shows a diagrammatic longitudinal section of a paper feeding apparatus according to the invention attached to a typographic printing group;
- Figure 2 shows a perspective view of a paper feeding apparatus according to the invention at the entrance of a printing machine;
- Figure 3 shows a perspective enlarged view of the apparatus of figure 2;
- Figure 4 shows a diagrammatic longitudinal section

of a different embodiment of the apparatus of figure 1.

As shown in figure 1, a paper feeding apparatus 1 is provided upstream with a printing typographic group 2 of a paper web 3 continuously fed.

Upstream the feeding apparatus 1 the paper 3 is in a unstretched condition and in particular it forms a loop 4. For example this occurs when the paper comes from another printing unit, such as a data printing machine like a laser printer or a needle printer. The loop 4 forms as a consequence of the need that the paper control in the two different machines be independent, such as for strict paper handling reasons in one of the two machines or in both of them.

In order to stretch the paper 3 which passes through printing rollers 5 of the group 2, the feeder according to the invention comprises a first dragging means 6, such as a teethed tractor, and a second dragging means 7, such as a couple of counter-rotating rollers 7a and 7b. Downstream the two dragging means 6 and 7, deflexion means of the paper are provided comprising in this particular case two rollers 8 and 9 which are placed so that the paper winds around each of them in an arch which is about 180°. In this way a possible sliding of the paper 3 itself is prevented.

The tractor 6, like that shown in figures 2 and 3, has teeth 6a which engage in holes 11 laterally made on paper 3. The tractor 6 with teeth 6a moves in the direction of arrow A at a speed V, and is put into rotation by a transmission shaft 12 driven in a known and not shown manner. The rollers 7a and 7b of the second dragging means 7 pull the paper at a speed V + 5%, driven by not shown driving means.

The pull of the second dragging means 7 causes the stretch of the paper as if the latter were unwound from a braked bobbin. In fact, this pull causes the first dragging means to rotate at a speed V + 5%, even if the torque acting on it is sufficient to provide only a speed V, as the driving of dragging means 6 and 7 is preferably of the electronically controlled torque type. This also prevents the holes 11 of paper 3 from tear for an excessive pull action with respect to teeth 6a. In fact the torque of the first dragging means 6 is slightly less than the torque of the second dragging means 7 so that the above stated 5% speed difference is obtainable. When a temporary excessive stretching of the paper occurs, the torque controlled driving immediately lowers the stretch to normal values, thus eliminating the possibility of tearing the web of paper.

Downstream the second dragging means 7 the directional rollers 8 and 9 have the only function of keeping the stretch of the paper which is then pulled by a third dragging means 15 provided for downstream the printing group 2 and dragging the web 3 of paper at a speed substantially equal to the speed of the second dragging means 7. The paper moves from rollers 7 to rollers 8 preferably with an angle of about 90° with respect to the dragging direction, so that possible side trackings of the paper are prevented.

Alternatively, as shown in figure 4, the second dragging means comprises three friction rollers 17, 18 and 19 rotating at the same angular speed. The paper wounds for in an angle of about 180° forming a U path 3a on intermediate roller 18, which is counter rotating with respect to roller 17 and 19 and frictionally contacts them.

Advantageously, tractor 6 comprises one-direction rotary means, such as a freewheel coaxial with the transmission shaft 12, so that a possible drawing back of the paper is prevented when the latter stops for whichever reasons. In fact, it would be otherwise possible that, when the paper stops, a slight drawing back of the paper occurs due to a relaxing of the paper itself, owing to the pre-existing above described speed difference between the two dragging means 6 and 7. This drawing back would cause the loss of the control of the position in particular when an encoder is provided, attached to tractor 6, for measuring the linear extension of the paper.

Notwithstanding reference has been made to a tractor as first dragging means 6, it is not excluded that another kind of dragging means is used, such as a further couple of counter rotating rollers, put before the second dragging means 7. These further rollers should drag the paper at a speed V 5% less than the speed of the second dragging means 7.

Also the 5% difference of the dragging speed can be advantageously varied in the range comprised between 2 and 15%, as a function of the capacity of the paper to resist in correspondence of holes 11 as well as a function of the strength and of the speed of the paper itself.

The paper feeding apparatus according to the present invention thus allows to provide the printing group with a stretched web of paper even when the paper available upstream is in the form of a loop or in another unstretched condition, without the use of the presently known stretching means which are complex and encumbrant.

## Claims

1. A paper feeding apparatus for printers and similar machines, in particular, but not exclusively, suitable for providing a stretched continuous web (3) of paper starting from an unstretched condition, characterised in that it comprises a first (6) and a second (7) dragging means, one after the other and both dragging said paper (3), said second dragging means (7) dragging said paper (3) at a speed greater than 2-15% the dragging speed of said first dragging means (6).

2. Paper feeding apparatus according to claim 1, wherein said first and second dragging means (6, 7)

comprises means for the control of the dragging torque, that torque imparted to the second dragging means being higher than that of said first dragging means, whereby the rotation speed of the latter is about 2-15% higher than the speed of the former.

3. Paper feeding apparatus according to claims 1 and 2, wherein the dragging speed of said second dragging means (7) is about 5% higher than that of said first dragging means (6).

4. Paper feeding apparatus according to either to claims 1 to 3, wherein said first dragging means (6) comprises a tractor.

5. Paper feeding apparatus according to claims 1 to 3, wherein said second (7) dragging means comprises two counter rotating friction rollers(7a, 7b).

6. Paper feeding apparatus according to claims 1 to 3, wherein said second dragging means (7) comprises three friction rollers (17, 18, 19), one of them (18) being intermediate to the other two (17, 19) and frictionally contacting the other two (17, 19) forming with them a U path (3a) for said web (3).

7. Paper feeding apparatus according to the previous claims, wherein said tractor (6) comprises one-direction rotation means and means for the control of the position of the paper.

8. Paper feeding apparatus according to claim 7, wherein said one-direction rotation means comprises a freewheel and said means for the control of the position of the paper comprises an encoder.

9. Paper feeding apparatus according to the previous claims wherein, after said second dragging means, means for the deflection of the paper are provided for comprising two directional rollers (8, 9) with winding arch each about 180°, said deflection rollers (8, 9) being reached by the paper (3) after an angle of about 90° of the paper (3) exiting from said second dragging means (7).

FIG. 1

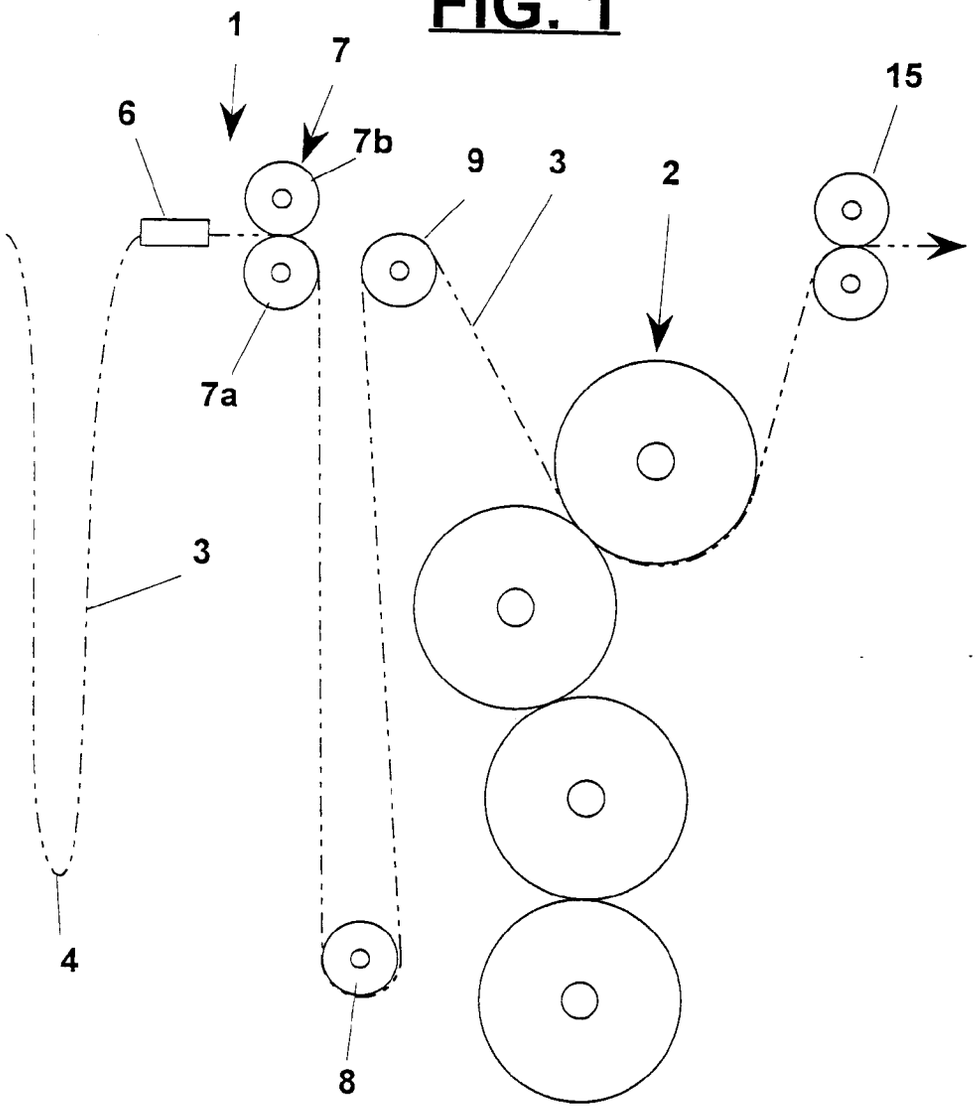



FIG. 4

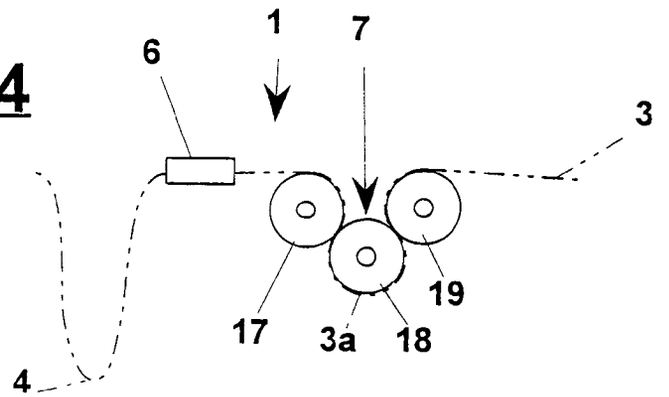
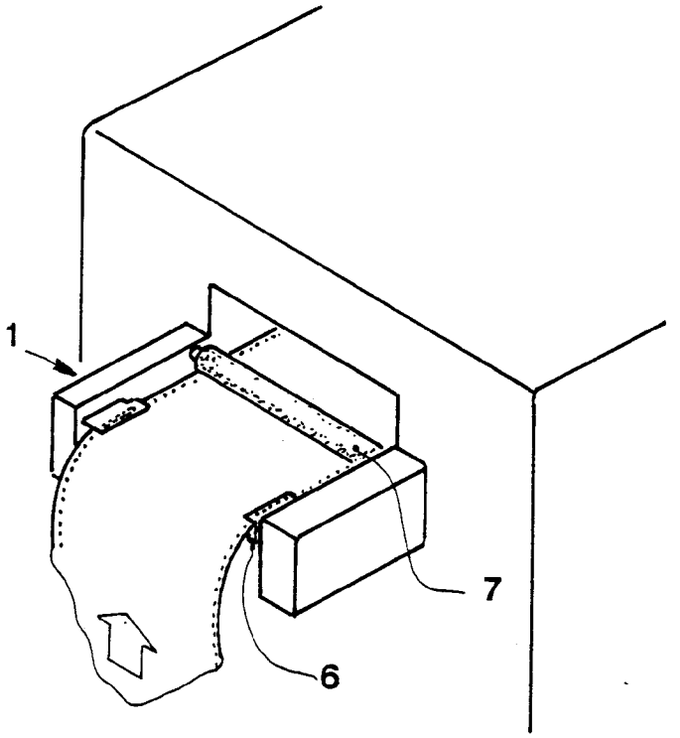


FIG. 2



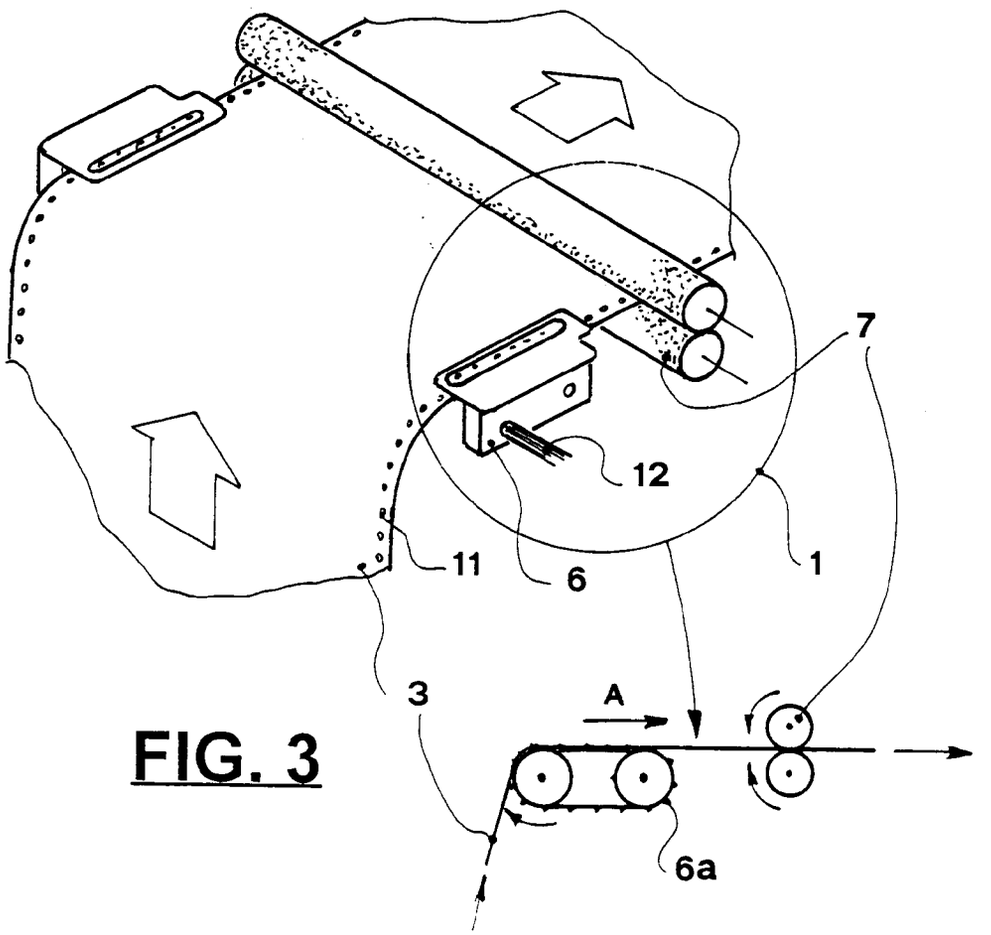




FIG. 3

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# EUROPEAN SEARCH REPORT

Application Number
EP 95 83 0318

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| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (Int.Cl.6) |
|---|---|---|---|
| A | US-A-3 955 737 (J.E. TRAISE)<br>* the whole document *<br>--- | 1,4,5,7 | B65H23/188 |
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The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| THE HAGUE | 27 November 1995 | Häusler, F.U. |

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| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| THE HAGUE | 27 November 1995 | Häusler, F.U. |

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