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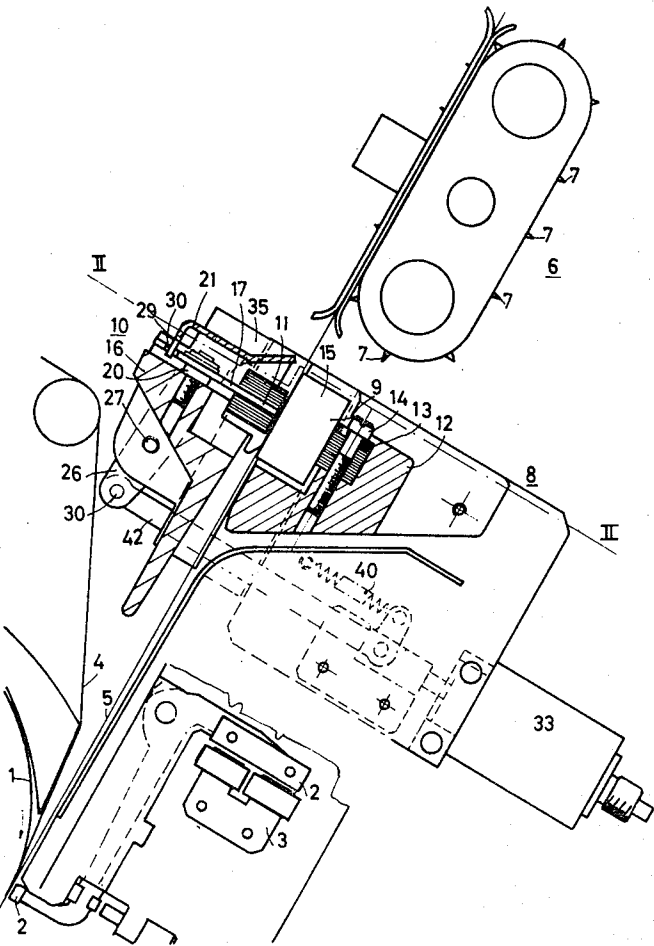
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[54] **PAPER ARRESTING DEVICE FOR HIGH SPEED PRINTERS**
5 Claims, 4 Drawing Figs.

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101/93, 188/104
[51] Int. Cl..... **B41j 5/00,**
B41j 9/38
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151, 153, 15; 101/93, 288, 292; 226/150, 162,
149, 147, 143, 93, 95; 188/156, 161, 164

ABSTRACT: A device for clamping the print receiving paper in a high speed impact-type drum printer, wherein a series of electromagnets are disposed across one side of the width of the paper and a series of cooperating armatures are disposed on the other side of the paper opposite the electromagnets, and wherein during the printing phase the electromagnets are energized and attract the opposed armatures thereto, thereby preventing movement of the paper under the pull of printing impacts on the paper against the rotating drum.



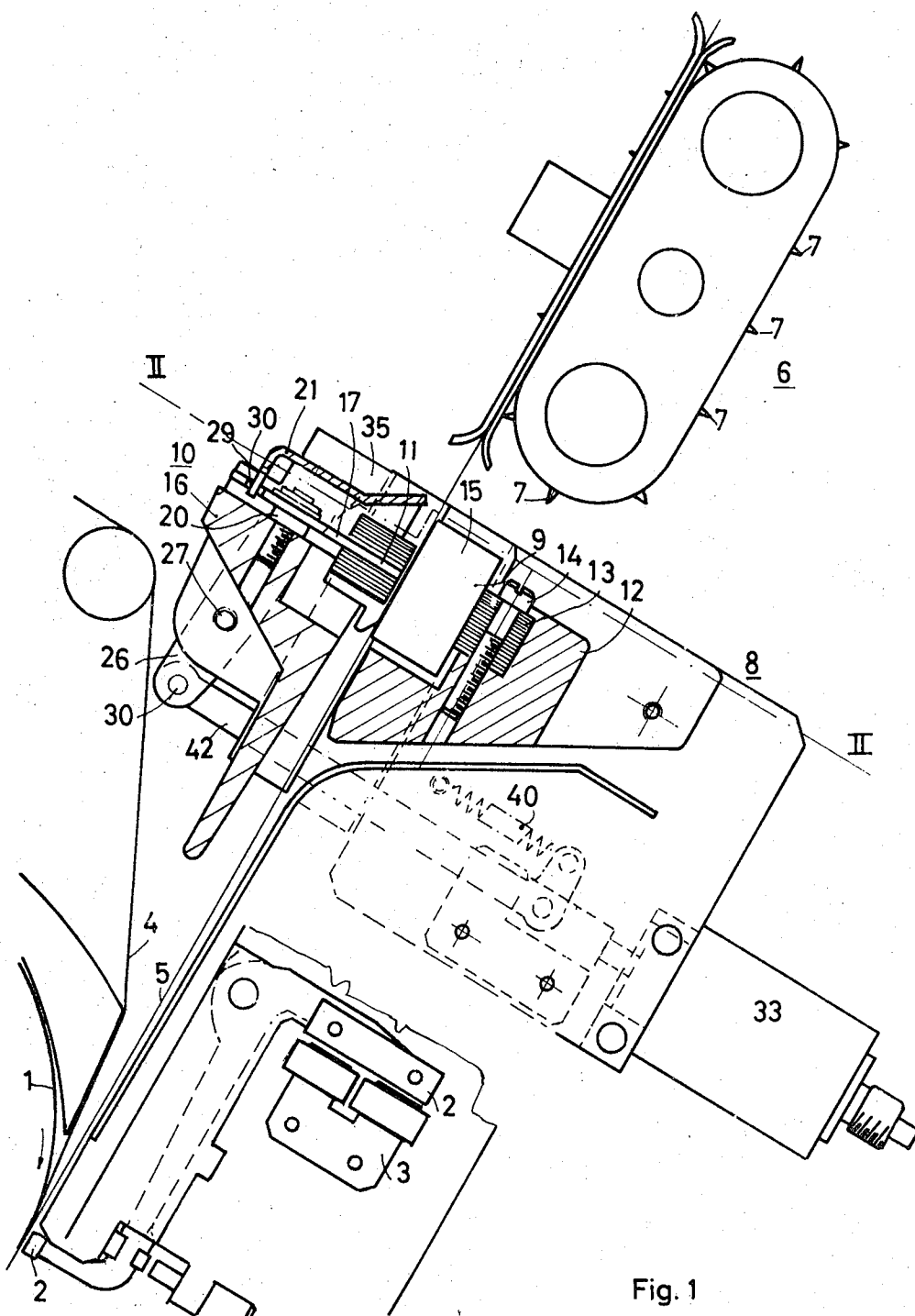


Fig. 1

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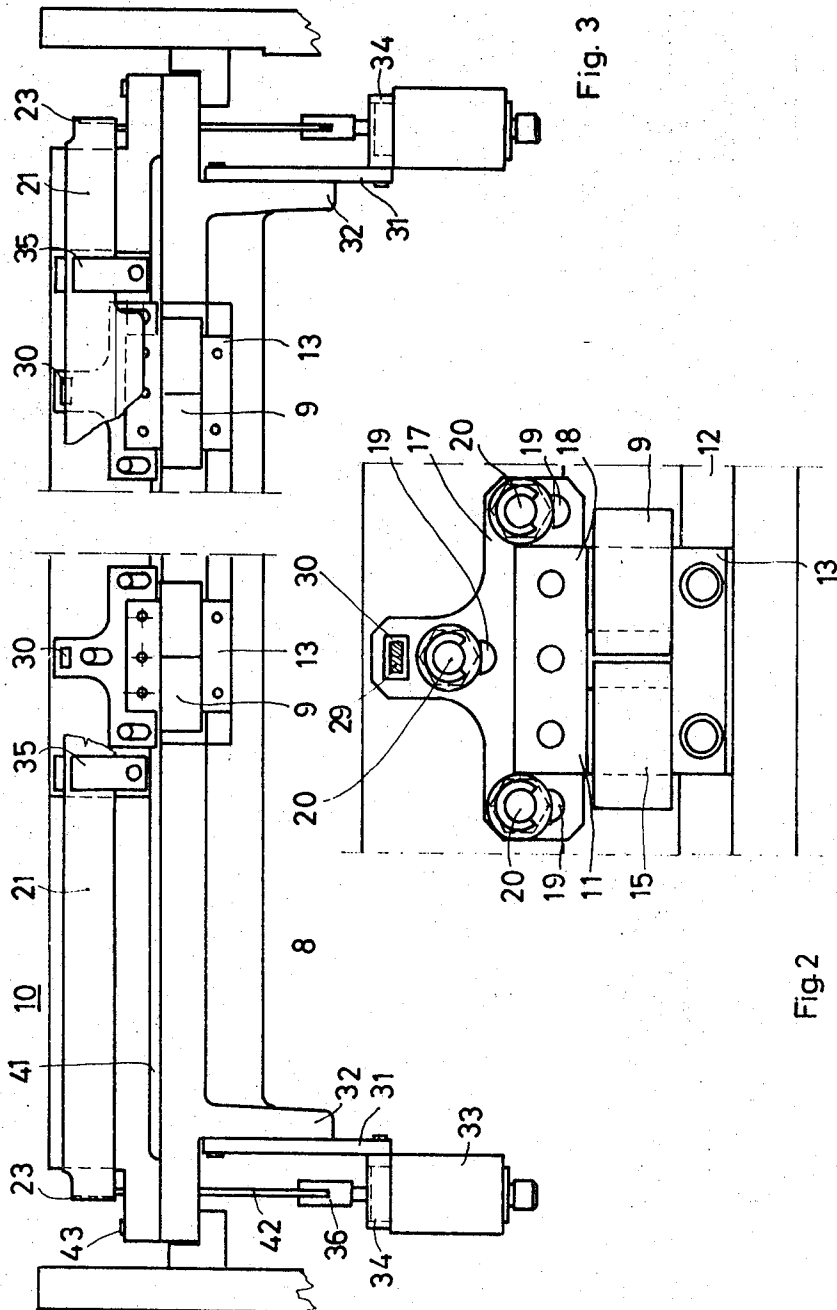


Fig. 3

Fig. 2

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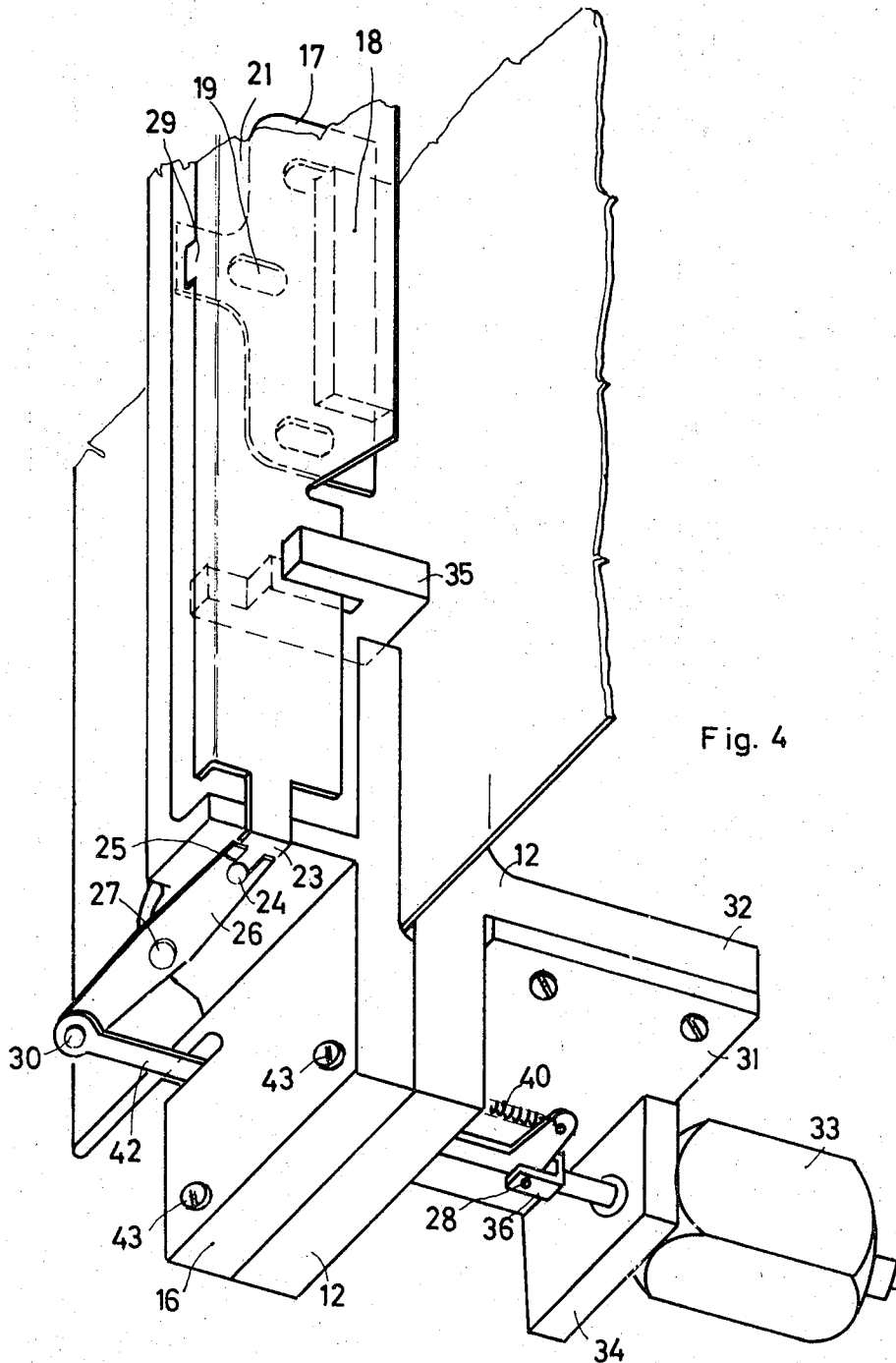


Fig. 4

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PAPER ARRESTING DEVICE FOR HIGH SPEED PRINTERS

The present invention relates to an electromagnetic device for preventing the backward motion of the print receiving paper during the printing cycle in high speed printers such as are used with electronic data processors.

According to a known arrangement, these printers include a continuously rotating drum which carries parallel rings, each containing one or more font of print characters in relief on its periphery. The print receiving paper sheets, and the associated inking means, which may be an ink ribbon, or one or more carbon paper sheets or carbon paper ribbons, are arranged to pass in close proximity of a generatrix of the drum. A hammer set, including a hammer for each character ring, corresponding to each print position on the print line, is located in front of the drum. Each hammer, which is electromagnetically controlled, may be propelled against the drum to force the paper against the inking means and the type to be printed. The complete line is printed in a time not exceeding the time required for the whole font of characters to pass the position of the print line. This phase of operation is called the "printing cycle." At the end of the printing cycle, the paper is advanced rapidly for a space interval approximately equal to the distance between print lines, to allow the printing of the following line. This phase of operation is called the "line feed cycle."

During the printing cycle, the paper, being driven by the hammers against the rotating drum, is subjected to a driving force in the direction of the rotation of the drum, which is generally opposite to the direction of the paper feed.

Due to the clearances existing in the paper feed device, and to the unavoidable slack of the paper this driving force may cause the paper to move backward in differing degrees according to the different print positions, thus resulting in a considerable misalignment between characters of the same print line.

Attempts have been made to eliminate the foregoing problem through the use of leaf springs intended to apply friction to the paper, but such devices do not satisfactorily solve the problem.

Apparatus made according to the invention, prevents the foregoing problem by providing a number of electromagnets cooperating with slidable problem armatures, which electromagnets, when energized, clamp the paper between the cores and the armatures in order to prevent any motion of the paper. The device is provided, in addition, with control means for making the introduction of the paper easier through movement of the armatures to a sufficient distance from the cores.

These and other features of the invention will appear more clearly from the following description of an illustrative embodiment thereof, with reference to the accompanying drawings wherein:

FIG. 1 is a representation of a side view, partially in section, of the apparatus;

FIG. 2 is a front view of a portion of the device comprising an electromagnet, as seen from a section taken along line II-II of FIG. 1;

FIG. 3 is a partial front view of the apparatus;

FIG. 4 is a partial view in perspective, of the armature lifting mechanism.

With reference to FIG. 1, the type carrying drum 1 is continuously rotating in the direction indicated by the arrow. The hammer 2, impelled by electromagnet 3, forces the ink ribbon 4 and the paper 5 against the drum during the printing cycle, to cause the printing of a character. For reasons of clarity only one sheet of paper is shown, but as is well known in the art, there may be many sheets interleaved with paper carbon sheets or ribbons, to obtain a corresponding number of copies, without changing the manner of operation of the device.

During the line feed cycle, the paper is caused to advance upwards for a predetermined distance, by means of paper feed devices, known as paper tractors, located at both sides of the

paper sheet. One of such tractors is represented in FIG. 1, where it is referred to as a whole by reference numeral 6. It comprises substantially a belt of metal meshes, each one of said meshes carrying a pin 7. These pins engage appropriate holes perforated on both edges of the paper sheet. The belts are set in motion through use of a motor and clutches, (not shown) properly controlled to provide the advancement of the paper during the line feed cycle. It is obvious that the clearances between the different parts of such paper feed devices, and in particular between the pins and the holes perforated in the paper, cannot be of proper precision as to prevent any backward motion of the paper during the printing cycle when subjected to the action of the rotating drum and the hammers.

The apparatus made according to the invention is located between the type carrying drum 1 and the feeding device 6. It comprises a rear part, referred to as a whole by reference number 8, including electromagnets 9, and a front part, referred to by reference number 10, including the slidable armatures 11, which cofunction with their respective electromagnets 9. The paper sheet is located between the electromagnets and their corresponding armatures.

The rear part is formed with a rear horizontal bar 12 extending the entire lateral width of the printer, the bar being fastened to the printer frame by means of screws 43 (see FIGS. 3 and 4). The electromagnets 9 are in turn fastened to the rear horizontal bar in sufficient number to span the width of the print line. A convenient number, for the usual width of paper sheets, is, for example, six.

One of these electromagnets and the related slidable armature are shown in FIG. 2, as seen from the section taken along line II-II of FIG. 1.

Each electromagnet includes a U-shaped core 13, formed of iron sheets of convenient magnetic and electrical properties, such as is known to anyone skilled in the art, and riveted together to form a core assembly. This core is fastened, by means of screws 14, to the horizontal rear bar 12 and may be magnetized by means of a current flowing in coils 15, positioned on the legs of the U-shaped core.

The front portion 10 of the device comprises a front horizontal bar 16 extending the entire lateral width of the printer, and fastened by means of screws 43 to the frame of the printer as well as to the rear horizontal bar 12. A slit 41, sufficient for allowing the free passage and the easy manual introduction of the paper sheet, is provided between front bar 16 and rear bar 12.

In alignment with the electromagnets 9, fastened to the rear horizontal bar 12, the cooperating armatures 11 are slidably mounted on the front horizontal bar 16. Each armature 11 comprises a plate 17 to which the iron sheets forming the magnetic portion of the armature are riveted. The plate 17 is provided with three longitudinal slots 19. Three pins 20 passing through these slots secure the plate 17 to the front bar 16 while allowing the plate to slide in a direction perpendicular to the plane of the paper for a distance limited by the length of the slots. The plate 17 also is provided with a transverse slot 30. A covering plate 21 extended sidewise over the entire width of the front horizontal bar 16, is slidably secured to this bar by means of guide members 35 which allow the covering plate to perform a sliding motion in a direction perpendicular to the plane of the paper and therefore parallel to the motion of the armatures. The covering over plate 21 has a portion which is bent downward, and which extends the entire length of the plate. This bent portion is provided with teeth 29, which engage the transverse slot 30 of the plate 17.

At both of its ends, the covering plate 21 is provided with two extensions 23, bent downward at a right angle to the plate, as shown in FIG. 4. These extensions each carry a pin 24, which engages an open slot 25 provided in the terminal portion of a lifting lever 26, rotatably mounted by means of pivot 27 on the front horizontal bar 16.

This lifting lever 26 is joined to the pull bar 42 which is in turn connected by pin 28 and fork 36 to the armature of the

lifting electromagnet 33, fastened, by means of support 34 and plate 31, to a rib 32 of the rear horizontal bar 12. The pull bar 42 is subjected to the action of the restoring spring 40.

One of such lifting devices, comprising electromagnet 33, pulling bars 42, lifting levers 26 is provided at each end of the horizontal bar.

The operation of the device is as follows:

In rest position, each armature 11 rests, by reason of its weight, on core 13 of the correspondent electromagnet 9.

When the paper is to be introduced, a device, not shown, energizes under manual control, both lifting electromagnets 33 which through fork 36 and pin 28 pull the bar 42 against the action of the spring 40. This causes the lifting lever 26 to rotate around pivot 27 in the counterclockwise direction. The open slot 25 of the lifting lever forces the covering plate 21 to be moved upwards by means of pin 24. Teeth 29, which engage the transverse slots 30 of plates 17, force the armatures 11 to move away from the cores 13 for a distance sufficient to facilitate introduction of the paper sheet.

When the introduction is completed, the electromagnets 33 are deenergized, and under the action of the restoring springs 40 the covering plate 21 returns to its lower position. The armatures each return to rest against their core after the interposition of the paper sheet. In this condition, a small clearance remains between the upper side of a tooth 29 and the upper side of the horizontal slot 30, as shown in FIG. 2.

As the angle of inclination of the plane of the plates 17 on the horizontal is approximately 30°, the component of the weight of the armature in the direction of their motion is small, and is furthermore reduced by the friction between plate 17 and pins 20. As a consequence, each armature rests very lightly on the paper sheet and does not hinder the paper feed motion during the feeding cycle or during any paper feeding operation.

At the beginning of the printing cycle, the electromagnets 9 are energized, and the armatures 11 are attracted to the cores, clamping the paper sheet therebetween. The paper sheet is therefore immobilized, and no backward motion, however, small, may take place under the combined action of the printing hammer and the drum.

At the end of the printing cycle the electromagnets are deenergized, and the paper is free to advance under the action of the feeding apparatus.

It may be noted that the travel of the armatures due to the energization of the electromagnets 9 is practically nil, and therefore no impact of the armatures against the paper sheet takes place when the electromagnets are energized. Therefore, there is no danger that the carbon paper sheets or similar inking means which may be interleaved between the paper sheets in the field of the electromagnet will leave marks on the underlying sheets.

I claim:

1. In a printing device wherein the print operation comprises printing a print line of information transversely to the length of an elongated print receiving member during a print cycle and moving said member along its length during a feed cycle, a print receiving member arresting device for clamping said member during said print cycle comprising: electromagnetic means extending substantially along the entire width of said print line and disposed parallel thereto on one side of said member, a support means disposed on the other side of said member, armature means extending substantially along the entire width of said print line and disposed parallel thereto on

the other side of said member and opposite to said electromagnetic means, and means for slidably mounting said armature means on said support means to permit said armature means to slide in a direction transverse to the plane of said member and to permit said armature means to slide under its own weight to rest against said member.

2. The printing device of claim 1 wherein said electromagnetic means comprises a plurality of electromagnets spaced apart along the width of said print line and said armature means comprises a plurality of armatures spaced apart along the width of said print line and opposite to respective ones of said electromagnets, and wherein each of said armatures is individually slidably mounted on said support means for sliding under its own weight to rest against said print receiving member.

3. The printing device of claim 2 further including a lifting member coupled to each of said armatures and movable in a direction transverse to the plane of said print receiving member for moving all of said armatures away from said electromagnets to permit the introduction of said print receiving member between said armatures and electromagnets.

4. The printing device of claim 3 further including a lifting electromagnet coupled to said lifting member and, when energized, adapted for moving said lifting member away from said electromagnets.

5. In a printing device wherein the print operation comprises printing a print line of information transversely to the length of an elongated print receiving member during a print cycle and moving said member along its length during a feed cycle, and wherein a print receiving member feeding means moves said member during said feed cycle, a print receiving member arresting device for clamping said member during said print cycle comprising: a rear horizontal bar extending over the entire width of said print receiving member and fastened to the frame of said printing device between said print line and said feeding means, a plurality of electromagnets spaced apart along the width of said print line on one side of said print receiving member, said electromagnets being fastened to said rear horizontal bar, a support means disposed on the other side of said print receiving member, a plurality of armatures spaced apart along the width of said print line and opposite to respective ones of said electromagnets on the other side of said member, each of said armatures being individually slidably mounted on said support means for sliding under its own weight to rest against said print receiving member, a lifting electromagnet disposed at each end of said rear horizontal bar, a pair of pull bars, pull bar restoring springs, said pull bars being responsive to the energization of said lifting electromagnets to move longitudinally against the action of said restoring springs, a pair of lifting levers, each of said lifting levers being responsive to a respective one of said pull bars to effect a small rotation, a covering plate extending over the length of said support means, said covering plate having lateral bent extensions engaged by the ends of said lifting levers and downward bent tooth extensions, each of said tooth extensions engaging a transverse slot in a slidable plate carrying each of said armatures, said covering plate being responsive to the energization of said lifting electromagnets to move in a direction perpendicular to the plane of the print receiving member to thereby move said armatures a predetermined distance from said electromagnets to permit the introduction of a print receiving member therebetween.