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RIBBON TENSIONING MECHANISM FOR HIGH SPEED PRINTERS

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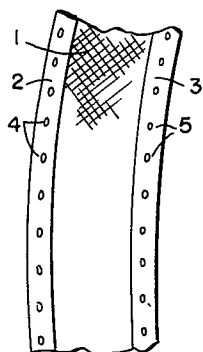


FIG. 1

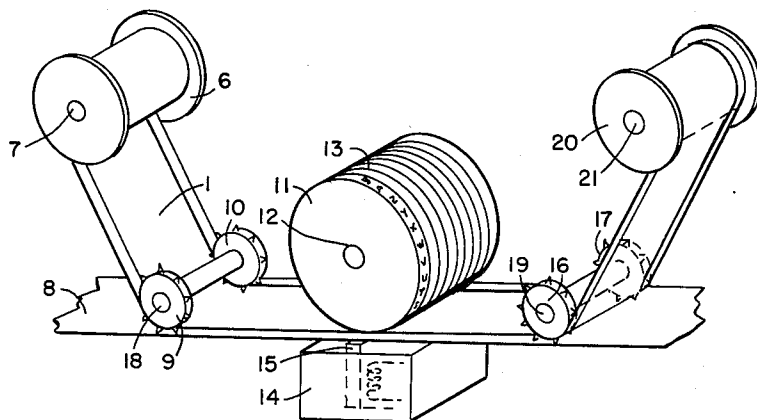


FIG. 2

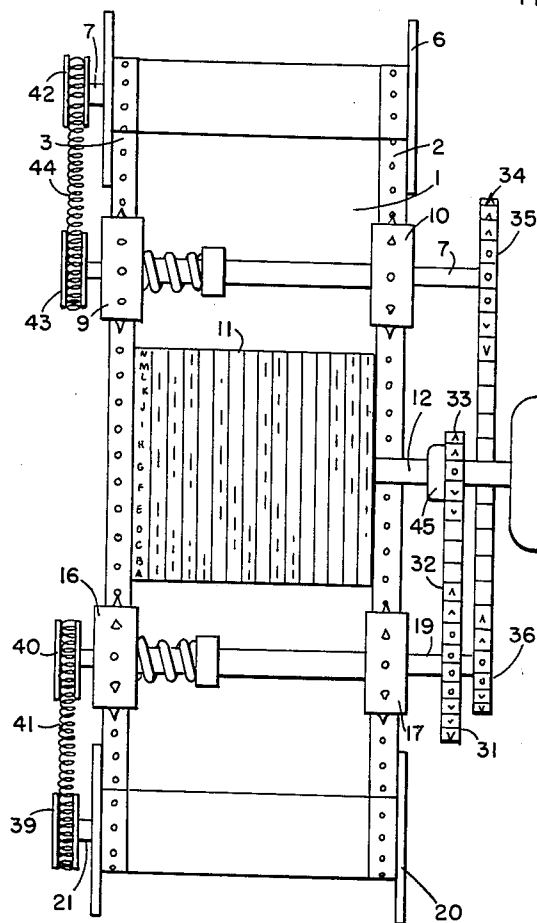


FIG. 4

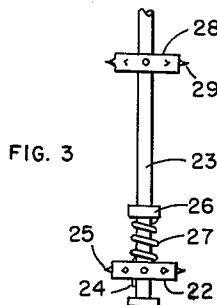


FIG. 3

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RIBBON TENSIONING MECHANISM FOR HIGH SPEED PRINTERS

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1 Claim. (Cl. 101—100)

The present invention concerns high speed drum printer ribbons and lateral tensioning means for such ribbons.

The present invention is generally applicable in high speed line printers in which a separate type font is presented in each printing position during each printing cycle. The type fonts are arranged circumferentially on a cylindrical drum whose axis lies parallel to the plane of the paper on which the information is to be printed, said axis being oriented perpendicular to the direction of the feed motion of the paper. A multiple, parallel hammer assembly is mounted on the opposite side of the paper from the type drum, and so oriented that when the hammer is actuated, it depresses the paper into tangential contact with the character then present at the impact line.

An inked ribbon is interposed between the paper and the type drum whereby an image of the type character impacted is transferred to the paper. The ribbon extends across the full axial length of the print drum and is moved or fed in a direction parallel to the motion of the paper. The conditions of operation of such ribbons are so severe that it is not unusual for a ribbon to require replacement after only a few hours use. This ribbon deterioration is produced by the severe mechanical action on the ribbon due to the hammer impact and the simultaneous sliding motion of the type face during contact. This action tends to crush the fibers of the ribbon and to stretch and distort the fabric. As a consequence, after a short period of usage, the ribbon becomes baggy and difficult to control. Ribbons are made of woven textile fabrics which inherently possess very low resistance to shearing distortion, making it difficult to preserve linear tracking of the ribbon, particularly when all or a portion of its width becomes mechanically distorted or damaged.

Guidance of these ribbons by means which are successful with other media such as flat belts, paper tape, or Mylar tapes, all of which possess shear stiffness, are not generally successful with fabric ribbons. For example, if one attempts to use flanged rollers or flanged guide posts to control the edge locus, one finds a tendency for the edge of the ribbon to roll or fold over on itself as soon as any significant lateral force is developed between the edge of the ribbon and the guide flange. Crowned or tapered rollers are not the solution either, because the absence of shear stiffness prevents a fabric ribbon from developing tracking forces on a crowned roller such as occurs with stiffer media.

Accordingly, the present invention consists in providing a stiff edge on the ribbon beyond the area where printing takes place, and in perforating this stiff edge with regularly spaced holes to engage driving and guiding sprockets. According to a preferred form of the present invention two pairs of sprockets are utilized one ahead of and the other behind the printing zone. One sprocket of each pair are coupled together so that they rotate in unison. The second sprocket in each pair is axially spring loaded away from its companion in order to apply lateral tension to the ribbon. In this way the movement of the ribbon is such as to prevent differences in the accumulated movement at the two edges of the ribbon, and therefore to constrain the ribbon to track in the desired

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path. Also, the tensioning of the ribbon in the printing area reduces the difficulties associated with sagging in this region.

According to the present invention the edge stiffening may be provided by one of a number of methods. One satisfactory method is to cement stainless steel strips of the order of .002" thick to the edges of the ribbon by means of thermo-setting epoxy adhesive. Other methods include cementing shear resistant material such as paper or Mylar to the edges of the ribbon. Another method consists in weaving heavier threads along the edges with a tighter weave and filling these areas with suitable stiffening filler such as starch or glue. It is preferred that the sprocket holes are accurately punched with holes of each pair lying on a common centerline lying straight across the ribbon after the reinforced edges have been formed. The inking is also preferably carried out after the reinforcing steps have been performed.

Accordingly, one object of the present invention is to provide methods of and means for improving high speed printer ribbons and the handling thereof.

Another object is to provide reinforcement of high speed printer ribbons.

A particular object is to provide improved high speed printer ribbons by providing reinforced, sprocket hole containing edges in such ribbons.

A still further object is to provide synchronized and laterally tensioned sprockets for handling edge reinforced and perforated high speed printer ribbons.

These and other objects will be apparent to those skilled in the art from the detailed description of the invention given in connection with the various figures of the drawing.

In the drawing:

FIGURE 1 is a view of a section of drum printer ribbon in accordance with the present invention.

FIGURE 2 is a diagrammatic representation of the essential components of a drum printer utilizing the present invention.

FIGURE 3 is a typical ribbon sprocket constructed in accordance with the present invention.

FIGURE 4 is a plan view of portions of a drum printer in accordance with the present invention.

In FIG. 1 is shown a fabric ribbon 1 provided with reinforced edges 2 and 3 punched with uniformly spaced sprocket holes 4 and 5. The reinforcements along the edges 4 and 5 may be strips of thin metal, paper, Mylar or other stiffening material cemented to the ribbon or the edges may be stiffened by utilizing heavier fibers in the fabric with the addition of glue or other stiffening agent. The uniformly spaced sprocket holes are punched in the stiffened edges in rows aligned so that holes on opposite edges fall on parallel lines across the ribbon and perpendicular to its edges.

FIG. 2 shows how this ribbon is used in a drum printer and how axially spring loaded sprockets are used to pull the ribbon across the surface of the character drum in the printing area. Character type carrying printing drum 11 carried on shaft 12 is rotated by suitable means (see FIG. 4) and is utilized for printing on a printing sheet 8 when hammers 15 of hammer assembly 14 are energized to squeeze the printing sheet through ribbon 1 against type faces 13 on the surface of drum 11. Ribbon 1 is moved between take-up reel 6 carried on shaft 7 and take-up reel 20 carried on shaft 21 under precise control of sprockets 9 and 10 on shaft 18 and sprockets 16 and 17 on shaft 19 as will be set forth in more detail in connection with FIG. 4.

The preferred form of the spring loaded sprocket in accordance with the present invention is shown in FIG. 3. Sprocket shaft 23 carries sprocket 28 secured to the

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shaft and sprocket 22 which is free to slide axially but is keyed to shaft 23 by key 24 so that both sprockets are turned by shaft 23 and sprocket teeth 25 and 29 are aligned and moved in synchronism. Sprocket 22 is urged axially and away from sprocket 28 by means of spring 27 bearing against collar 26. When this sprocket assembly is used, as in FIG. 2, to pull the printer ribbon it keeps the under lateral tension and thereby overcomes any tendency to sag or deform due to the pounding it experiences from the hammers.

FIG. 4 is a top view of a printer system in which type drum 11 is rotated by motor 30 over shaft 12. Motor power is supplied over leads 37—38 connected to a suitable power source not shown. The ribbon drive sprockets are driven from shaft 12 by suitable means such as chain 32 driven by sprocket 33 to drive sprocket 31 and chain 35 passing between sprockets 34 and 36. Suitable speed and direction may be determined by suitable gears contained in planetary drive 45 on shaft 12. The ribbon take-up spools 6 and 20 are turned by suitable slipping drives such as spring belt 44 passing between pulleys 42 and 43 and spring belt 41 passing between pulleys 39—40.

In operation ribbon 1 is moved under precise control of synchronized sprockets 9—10 and 16—17 and under lateral tension due to the sprocket longitudinal springs (FIG. 3). This control and tensioning provides handling of the large ribbons required in such drum printer systems without permitting creasing or rolling of the edges and also with minimum sag and other undesirable distortions.

It will be seen that while the ribbon construction and the ribbon handling devices according to the present invention have been shown and described in combination with a drum printer for which they are particularly adapted, that they may also be used to advantage in other high speed printers as, for example, in chain or belt type printers. In fact they are adapted for use generally where unusual stresses may be placed on printing ribbons and particularly where the ribbons are unusually wide.

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While only a single embodiment of the present invention has been shown and described, modifications will be apparent to those skilled in the art and within the spirit and scope of the invention as set forth specifically in the appended claim.

What is claimed is:

In a system for moving a printing ribbon over the printing area of a printer apparatus and the like, the combination including, a printing station having hammers and type font, printing ribbon storage means located relative to said printing station to permit a ribbon to be fed contiguously past the printing station, a printing ribbon including perforations at the edges for engaging sprocket means, and ribbon feed means including tensioning means comprising at least two shafts journaled transverse of the direction of feed for said ribbon on opposite sides of said printing station, first and second sprocket means rotatably fixed on each shaft, corresponding sprocket means being slidable freely on each respective one of said shafts, and resilient means continually acting against each respective one of said slidable sprocket means in a direction away from the other sprocket means so that a printing ribbon is maintained under a substantially uniform, lateral tension.

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