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[72] Inventor **Nicholas Jr. Kondur**
Northville, Mich.

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[73] Assignee **Burroughs Corporation**
Detroit, Mich.

[54] **METHOD AND APPARATUS FOR INHIBITING NOISE IN A HIGH-SPEED DRUM PRINTER**
4 Claims, 2 Drawing Figs.

[52] **U.S. Cl.** **101/93,** 197/151, 197/183
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[50] **Field of Search** ..... 101/93, 93 R, 93 C, 113; 197/151, 147, 172, 183

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Primary Examiner—William B. Penn
Assistant Examiner—E. M. Coven
Attorney—Charles S. Hall

ABSTRACT: A method and apparatus for reducing high-frequency noise in a high-speed drum printer caused by frictional forces induced in a paper web situated between the type characters on a continuously revolving high-speed drum and a linearly moving inking ribbon. A thin tape of material having a low coefficient of friction, such as Mylar, is interposed between the drum and the paper web so that, when a hammer strikes the ribbon and drives the paper web against the tape and drum, the revolving type characters on the drum will slide over the tape surface thereby attenuating the induced vibrations in the paper web. The secondary lower frequency noise generated by the impact of the hammer against the inking ribbon, paper web, and drum is also reduced since the tape cushions the impact.

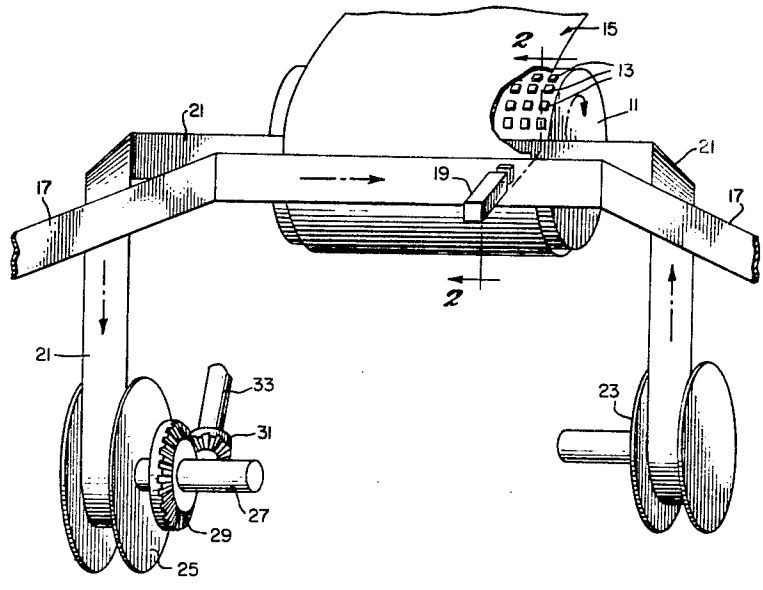
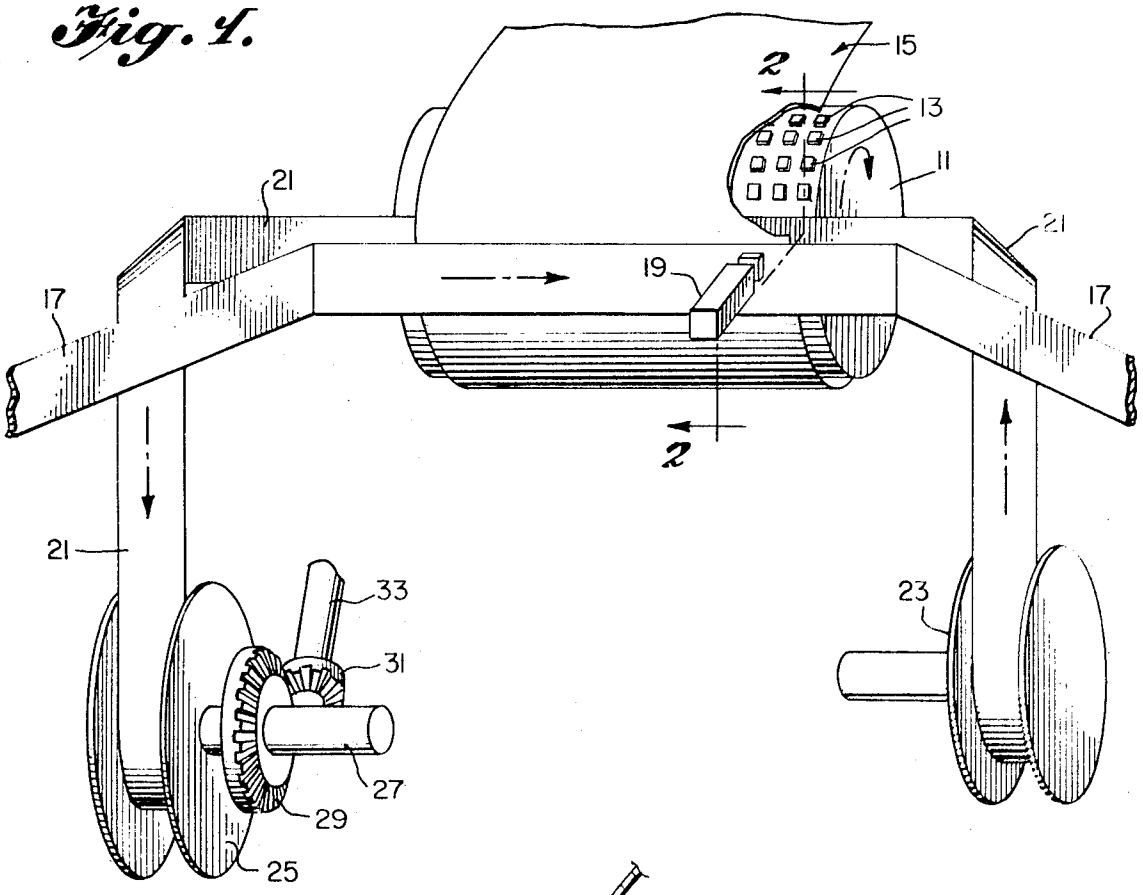


Fig. 1.



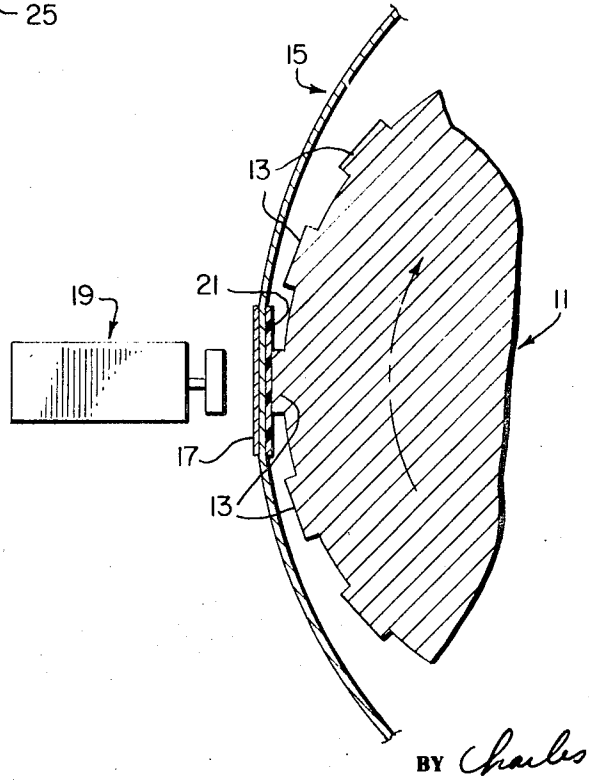


Fig. 2.

INVENTOR
NICHOLAS KONDUR

BY Charles R. Donohoe

AGENT

METHOD AND APPARATUS FOR INHIBITING NOISE IN A HIGH-SPEED DRUM PRINTER

BACKGROUND OF THE INVENTION

This invention relates to a method and apparatus for reducing noise in a high-speed drum printer by interposing a thin tape having a low coefficient of friction between the type characters on a rotating drum and a paper web.

Present day high-speed printers such as those used with computers and high-speed office calculators are frequently designed to provide a printed output of up to 1,000 lines per minute. One technique for accomplishing this high rate of printing is called on-the-fly printing wherein a constantly rotating print drum with raised-type characters thereon is struck by a hammer in order to produce an imprint on an intermediately positioned paper web.

Although many improvements have been made since this technique of printing was first used, high-frequency noise from vibrations induced in the paper web have proved to be excessive. These vibrations are induced by friction forces directed along the plane of the web generated by the revolving motion of the raised-type characters against the paper web. In addition to generating excessive noise, the vibrations induced in the paper web due to these frictional forces often damaged or weakened the paper web.

Accordingly, it is an object of this invention to reduce the high-frequency noise generated in the paper web by a high-speed, on-the-fly printer.

It is also an object of this invention to protect a paper web from damage due to vibrations induced therein by a rotary drum printer during the printing operation.

It is still a further object of this invention to diminish the amplitude of vibrations induced in a paper web in a high-speed drum printer by a simple and economical means.

SHORT STATEMENT OF THE INVENTION

In seeking these objects applicant has invented a method and apparatus for reducing noise in an on-the-fly printer by interposing a thin, smooth surfaced tape having a low coefficient of friction between the raised-type characters on a constantly rotating drum and a paper web. Vibrations induced in the paper web from friction forces directed along the plane thereof, which are generated by the movement of the type characters against the paper web, are reduced because the smooth surfaced tape diminishes the friction grip between the paper web and the type characters. A secondary lower frequency noise generated by the impact of the hammer against the inking ribbon, paper web, and revolving drum is also reduced because of the cushioning effect of the tape.

The various objects, advantages, and features of this invention will become more fully apparent from the following detailed description, appended claims, and accompanying drawings in which:

FIG. 1 is a front view showing the printer noise inhibitor of the present invention;

FIG. 2 is a side view, not to scale, of applicant's printer noise inhibitor.

Shown in FIGS. 1 and 2 is a rotary print drum 11 having a plurality of raised print characters 13 thereon. A paper web 15 to be printed on is aligned with, and passes about drum 11. An inking ribbon 17 situated on the opposite side of paper web 15 from drum 11 is positioned and moved past web 15 by means well known in the art. A hammer 19 is aligned perpendicular to the plane of inking ribbon 17 and paper web 15 for reciprocating striking motion thereagainst.

In the past when hammer 19 struck inking ribbon 17 and forced paper web 15 against rapidly rotating drum 11, one of the raised-type characters 13 thereon made contact with paper web 15. The contact of the type character with web 15 induced a force in the paper web comprising an "impact" force vector directed into the web and perpendicular to the plane thereof and a friction force vector directed along the plane of the web perpendicular to the "impact" force. The friction force was caused by the rapid movement of the type character along the relatively rough surface of the relatively stationary web. The friction force induced high-frequency vibrations in the paper resulting in a high-pitch screeching noise and possible damage to the paper fabric. Additionally, at the same time that web 15 was being raised slightly upward under the gripping action of one of the type characters, the slow linear movement of inking ribbon 17 across the paper web 15 opposed this motion thereby inducing additional stress in the paper.

In order to inhibit the aforementioned induced stress and vibrations in web 15, applicant interposes a thin tape 21 comprised of material having a low coefficient of friction surface between drum 11 and paper web 15. The tape is stored in a supply spool 23 from which it is fed across drum 11 and web 15 to takeup spool 25. Takeup spool 25 may be mounted, for example, on a drive axle 27 having a bevel gear 29 mounted thereon. A second bevel gear 31 mounted on power axle 33 engages bevel gear 29. Rotary motion is coupled from axle 33 to takeup spool 25 through the coaction of bevel gears 29 and 31. Spool 25 is rotated at a slow rate so that tape 21 moves very slowly across web 15 and drum 11, as compared to like movement of the ink ribbon. In the preferred embodiment, tape 21 is made of material capable of withstanding many successive impacts in a given area before wearing out, thereby rendering it possible that a spool of tape may last several years before replacement.

In operation, when hammer 19 strikes ribbon 17, pressing paper web 15 and tape 21 against drum 11, one of the raised type characters 13 thereon engages the surface of tape 21. Since the surface of tape 21 is smooth and therefore has a low coefficient of friction, the type character slips over the tape surface rather than gripping the relatively rough surface of web 15 as before. Therefore, the vibrations normally induced in web 15 are diminished to such an extent that a significant reduction in high-frequency noise is obtained and there is no damage to the web fabric. Since the upward drag on the paper web by the type characters is removed, the simultaneous lateral friction of the ribbon at the time of impact of the hammer is minimized. At the same time, the lower frequency "impact" noise generated when the hammer strikes the ribbon, paper and tape against drum 11 is reduced because tape 21 acts as a dampener thereby cushioning the impact.

In the preferred embodiment, the tape is a 0.002 inch thick strip of Mylar. Mylar is a trademark distinguishing a polyester film material manufactured by E. I. duPont de Nemours & Co., the material being polyethylene terephthalate, which is a polymer formed by the condensation reaction of ethylene glycol and terephthalic acid. Mylar is used because of its low cost, durability, and availability. However, many materials of varying thickness such as nylon woven ribbon, cotton woven ribbon, nylon solid ribbon, Teflon film and cellophane film have been successfully tested in applicant's invention, and therefore the scope of the invention should not be limited to the use of Mylar as a noise inhibitor.

I claim:

1. In the process of high-speed printing utilizing the steps of continuously rotating a character-bearing drum, advancing an inked ribbon substantially parallel to the axis of said drum and proximate the surface thereof, transporting a paper web between said ribbon and said drum, and impressing said paper web into contact with said characters by the movement of a print hammer; the improvement comprising the step of:

interposing between said character-bearing drum and said paper web a narrow strip of material having a low coefficient of friction surface for attenuating high-frequency noise and induced vibration normally generated by the frictional contact of said characters and said web during close contact therebetween as caused by said drum rotation and said print hammer movement.

2. The improvement of claim 1, wherein the step of interposing comprises transversely advancing a strip of Mylar more slowly than the ink ribbon, through the printing area.

3. In a high-speed rotary drum printer having a continuously rotating drum with raised-type characters thereon, a paper web movably positioned proximate said drum, a movable hammer adapted to impress said paper web into contact with said type characters, and an inking ribbon movably situated between said web and said hammer, the improvement comprising a narrow strip of material having a low coefficient of friction surface interposed between said raised type characters on said rotating drum and said paper web for attenuating high-frequency noise and induced vibration normally generated by the frictional contact between said web and said characters during close contact therebetween as caused by said drum rotation and said hammer movement, and means for moving said strip transversely to the path of said web.

4. The printer of claim 3 wherein said material is Mylar.