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[54] PRINTER MULTI-BELT TENSION CONTROL

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[58] **Field of Search** 355/104, 110

[56] **References Cited**

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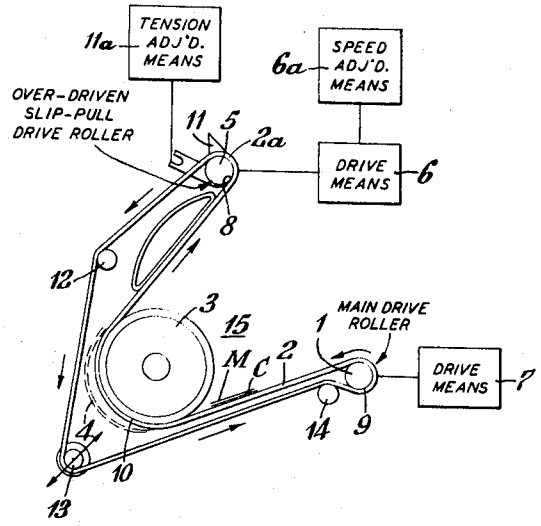
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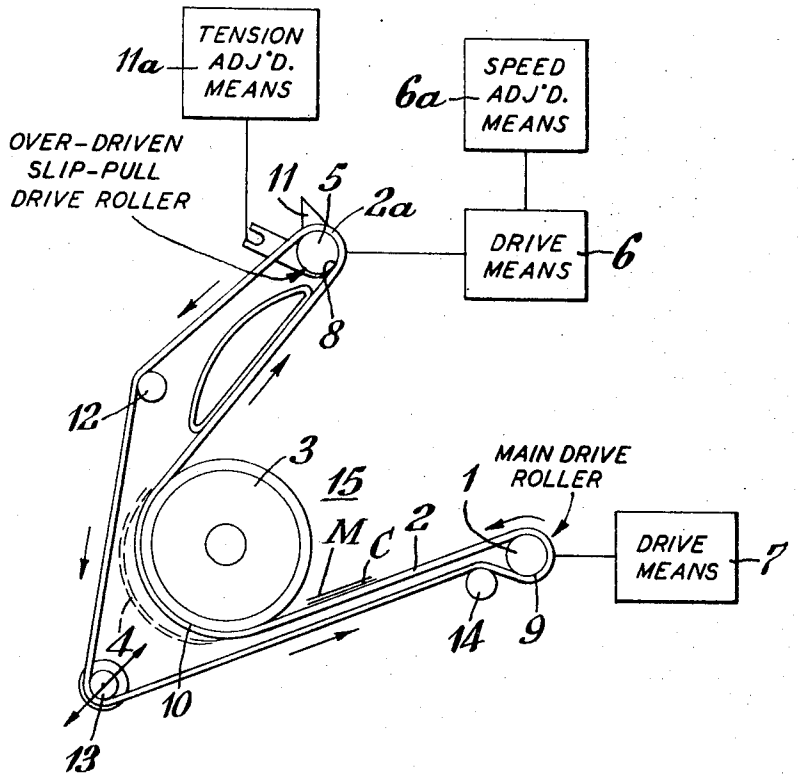
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[57] **ABSTRACT**

Master and copy materials are conveyed around the rotating glass cylinder of a printer in the exposure section of a whiteprint duplicating machine, by multiple belts which are driven by a main printer drive roller which advances the belts toward such glass cylinder, and an auxiliary booster drive roller which draws the belts from the cylinder by rotating at a speed slightly higher than that of the main drive roller. The outer surface of the auxiliary drive roller also has a coefficient of friction that is less than that of the main drive roller, so that the auxiliary drive roller continuously slips against the printer belt, but at the same time pulls and evens out the looped belts over the critical printing area of the cylinder.

2 Claims, 1 Drawing Figure





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PRINTER MULTI-BELT TENSION CONTROL

This invention relates to photo-copy machines, and more particularly to printer multi-belt tension control of a plurality of belts for conveying master and copy materials around the rotating glass cylinder of a printer.

In the past the multiple belts were driven by a single drive roller located just ahead of the printing cylinder, resulting in the slack side of the belts being located at or adjacent to the critical exposure zone of printing cylinder. Belt matching tolerances and inconsistent properties of the individual belts caused them to have varying tensions, which resulted in uneven and variable contact pressure between the master and print copy at the printing area adjacent such slack side of the belts.

The main object of this invention, therefore, is to provide a printer multi-belt tension control which overcomes such problems by novel means providing a controlled uniform and minimum amount of tension in the critical printing area.

Also, in the prior art, another disadvantage of the single drive roller system of driving multiple belts around the glass printing cylinder, was that the belts required a great deal of tension to keep them from stalling. Such high tension also caused buckling of the materials being processed, resulting in blurred images, and physical "wadding" of the prints.

Another object of the invention is to provide a novel multi-belt driving system which resolves such drawbacks of the prior art, thereby providing smooth and clear images in the prints produced by the machine, and increasing the efficiency thereof.

A further object is to provide a multiple belt drive for copying machines that is simple, inexpensive and effective, especially in the critical printing area thereof.

According to the invention such objects are accomplished by the provision of an auxiliary booster (pulling) drive roller which is located above the glass cylinder about which the belts are driven by the main (pushing) drive roller which is located in front of the cylinder. The auxiliary drive roller is driven at a speed slightly greater than that of the main drive roller. The anti drive surface of the auxiliary drive roller also is provided with a smooth finish having a coefficient of friction which is less than that of the main drive roller.

Therefore, the auxiliary drive roller slips continuously against the printer belt, but at the same time pulls and evens out the looped belts at the printing cylinder area. Having each belt drawn around the cylinder with the same tension, results in images of uniform density and with no blurring. At the same time, undesirable belt tension is reduced.

In the drawing, the single FIGURE is a view mainly in side elevation of a belt tension control system illustrative of the invention.

As shown in the drawing, a main drive roller **1** is rotated in a counter-clockwise direction to advance a plurality of belts **2** toward and about a glass printing cylinder **3**. Without the present invention this alone results in undesirable tensions in the critical exposure area, due to the (exaggerated) slackness at **4** in the adjacent side of the belts **2**. Such problem is solved

according to the invention by incorporating a novel auxiliary or booster (slip-pull) drive roller **5** in the system, located above the cylinder **3**. The auxiliary drive roller **5** is over-driven by means **6** having a speed slightly faster than that of the main drive roller **1** by its drive means **7**. Also the surface **8** of the roller **5** in contact with the printer belt **2***a* is smooth and provided with a coefficient of friction which is less than that of the surface **9** of the roller **1**.

Thus, in operation, the speed of the over-driven slip-drive roller is accurately set so that the auxiliary roller surface **8** slips continuously against the surface of the printer belt **2***a* and thereby uniformly pulls and tensions the belts **2** on the critical printing area **10** of the glass cylinder **3** with a finely controlled minimum amount of tension thereby gently taking up all of the unwanted slack at **4**.

The belts **2** convey master and copy materials M and C (note: put in correct position with respect to belts) as film, webs or shuts, first under the glass cylinder **3**, through the exposure zone **10**, than upwardly toward the auxiliary drive roller **5** which is picked-off by pick-off fingers **11**. The belts **2** then pass downwardly over idler-roller **12**, under tension-roller **13**, over nip-roller **14**, and finally around main drive roller **1**.

The roller **13** is adjustable so that the belt tensions can be finely adjusted and reduced up to 80 percent of the tension heretofore require with prior conventional single drive roller systems. This feature has the big advantage of eliminating possible "wadding" or buckling of the prints C. Another advantage of the auxiliary drive roller **5** is that far less power is required to drive the printer section **15** of the copy machine by virtue of the lower belt tension provided by the invention.

As used herein the term "glass" as applied to the printing cylinder, include all suitable transparent materials including plastics.

What is claimed is:

1. An improved apparatus for driving multiple belts which convey master and copy materials around the exposure zone of a rotating glass printing cylinder in a white-print duplicating machine, including

a main drive roller located beyond said printing cylinder and toward which the belts are advanced by said main drive roller; the improvement comprising

an auxiliary booster drive roller located beyond said printing cylinder having a surface with a coefficient of friction less than that of said main drive roller, and

means for driving said auxiliary booster roller at a speed greater than that of said main drive roller for continuously taking up any undesirable slack tending to form in the belts as they move on said cylinder through said exposure zone.

2. The invention as defined by claim **1**, in which

the speed of rotation of said auxiliary drive roller is only slightly greater than that of the main drive roller,

whereby the belts are continuously lightly tensioned as they move the master and copy materials over the critical printing area of the rotating glass cylinder.

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