United States Patent

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[54] **MANUFACTURING PHOTOGRAPHIC WEBS**
3 Claims, 4 Drawing Figs.

[52] **U.S. Cl.** **95/1.1**
[51] **Int. Cl.** **G03b 17/24**
[50] **Field of Search** 95/1.1; 352/6.6; 355/90

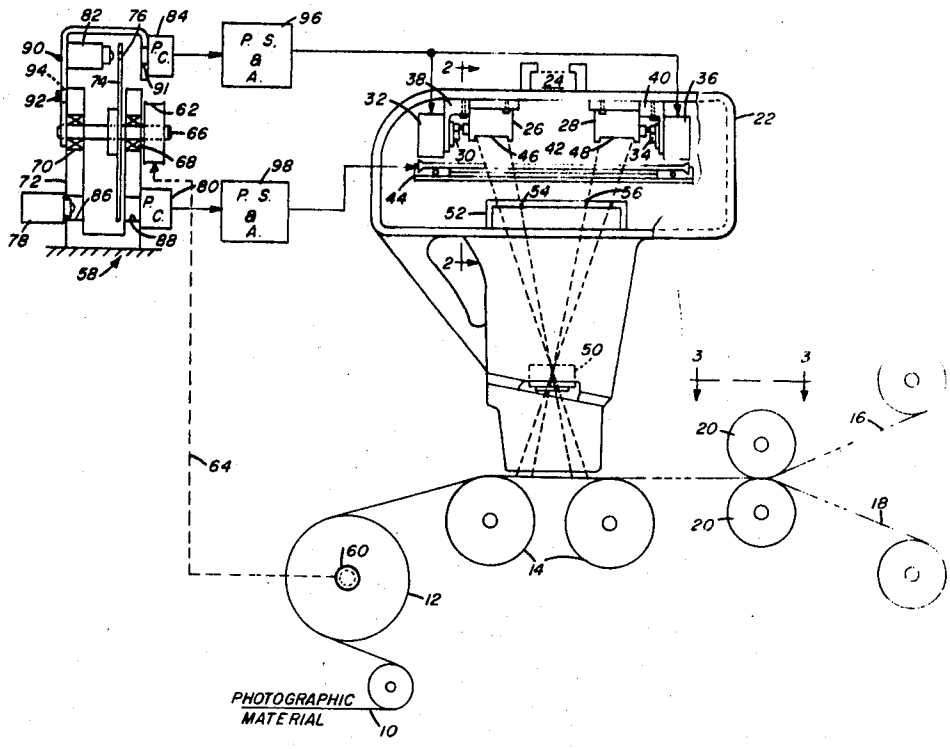
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ABSTRACT: A photographic web is manufactured with latent images of reference indicia along the length of such web. A projection printer embodies a mechanical counter which is driven by means of a stepping motor; and a flash tube is adapted to be excited after such discrete counter indexing (and before a subsequent indexing thereof) to image the counter face onto the web. A controller not only assures that the indicia is evenly disposed along the length of the web, but assures that flashing sees only stationary counts.



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SHEET 1 OF 2

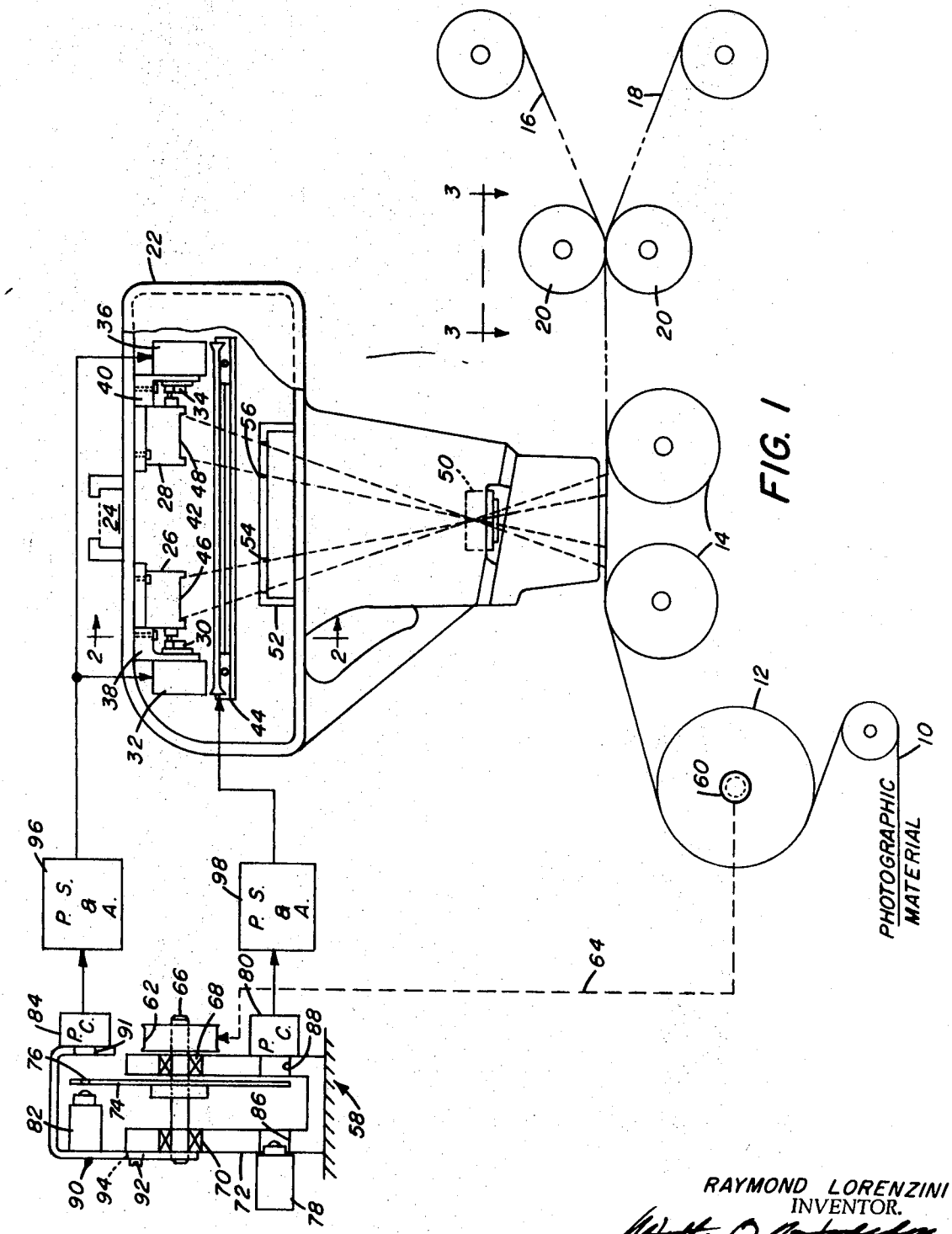


FIG. 1

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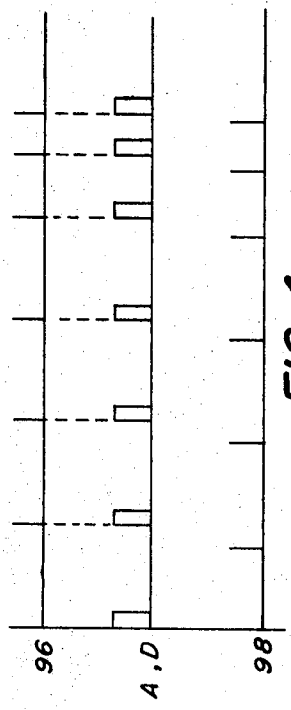


FIG. 4

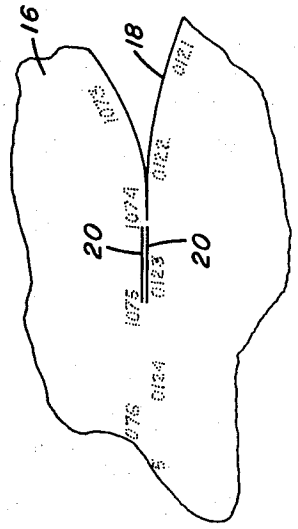


FIG. 3

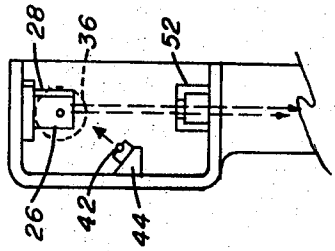


FIG. 2

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MANUFACTURING PHOTOGRAPHIC WEBS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates in general to the manufacture of photographic webs; and in particular to photographic webs which are manufactured with sequential latent images of reference indicia disposed along their respective lengths.

2. Description Relative to the Prior Art

In the use of photographic web products, especially movie film, it is frequently desired that such films be marked along their respective lengths with reference indicia whereby, for example, frame locations may be easily and quickly ascertained. One way of so marking a film web is to flash periodically the face of a mechanical counter onto the (margin of the) web during web manufacture, the web being thereby produced with latent images of numbered indicia; and which numbered indicia is later photographically developed during the usual processing of the exposed web.

To assure that the numbered indicia is evenly spaced along the length of the web, the counter is driven in accordance with the rate at which the web is handled by the manufacturing apparatus; and to this end, it had been customary to employ synchro data transmission techniques to drive the counter in question. As is known, a synchro-commanded shaft rotation is, by nature, made in a continuous way, rather than by discrete increments: Thus, in order to use synchro data transmission in the indicated environment, the counter—whose face was to be imaged on the photographic web being manufactured—had to have its units section permanently masked. This allowed the tens, hundreds, etc., sections of the counter, which index discretely and periodically, effectively to become the units, tens, etc., sections, respectively, of the counter. Discrete indexing of the count on the face of the counter is necessary to assure that the above-mentioned periodic flashing sees a stationary count (to prevent blurred latent images), a matter which is especially necessary in view of the fact that the film web itself is in continuous motion during its manufacture.

Aside from being wasteful of the available counts which a counter is capable of producing, the above-mentioned counter-masking technique undesirably causes the counter to run 10 times faster than the desired discrete indexing, and thus not only limits the life of the counter but also effectively limits the rate at which such discrete indexing may be made.

SUMMARY OF THE INVENTION

The invention proposes a device, useful in the manufacture of a photographic web, for providing latent images of sequential indicia along the length of such web, which device is characterized in that a mechanical counter, or the like, thereof is driven by means of a stepping motor, and that operation of such motor is timed in accordance with the rate at which such web is handled by the manufacturing apparatus. A flasher illuminates the face of the counter to image periodically such counter face onto the web; and a controller is provided to time not only the motor-and-counter to the web, but also to time the operation of the flasher relative to the operation of the motor, whereby flashing occurs assuredly between discrete indexings of the counter.

OBJECT OF THE INVENTION

The invention provides an improved apparatus for manufacturing a photographic web product having latent images of sequential reference indicia disposed along the length of such web product.

The invention will be described with reference to the figures, wherein:

FIG. 1 is a side elevational view, illustrating schematically, apparatus according to the invention,

FIG. 2 is a view of the apparatus of FIG. 1, taken along lines 2—2 of FIG. 1,

FIG. 3 is a plan view showing web manufacture according to the practice of the invention, and

FIG. 4 is a timing diagram useful in describing the operation of apparatus according to the invention.

With reference to FIGs. 1 and 2, a web 10 of photographic material is drawn from a supply thereof by means of a metering roll 12. The web 10 passes over support rollers 14 prior to being longitudinally slit into sections 16, 18 by means of rotary knives 20. As the web passes over the support rollers 14, it is exposed to reference indicia by means of a projection printer 22, such exposure and web handling taking place under controlled lighting conditions.

The projection printer 22 is slidably supported on a beam 24 so that the aim point for the printer 22 may be laterally positioned with respect to the web as desired. The printer 22 contains a pair of mechanical counters 26, 28 which are identical; and which counters may be of any well-known type. The counters 26, 28 are physically laterally shifted (See FIG. 2) with respect to each other within the housing of the printer 22. The counter 26 is driven, through gearing 30, by means of a stepping motor 32; and counter 28 is driven, through gearing 34, by means of a stepping motor 36. The stepping motors 32, 36, which are supported within the printer housing by means of respective brackets 38, 40, are adapted to rotate the input shafts of their respective counters 36 degrees per step.

A xenon flash tube 42 is supported within the printer housing, by means of a bracket 44, in such a way that the flash tube 42 is below and to one side of the counter 26, 28. The flash tube 42 has the usual excitation coil (not shown) to initiate its flash; and (separately powered) electrodes for sustaining such flash for the requisite duration. Thus, the flash tube 42 may illuminate the respective faces 46, 48 of the counters 26, 28; and when such faces are illuminated, they are projected through, and imaged by, a lens 50 onto the web 10. To assure that only the counter faces 46, 48 get projected through the lens 50—rather than the full interior of the projection printer 22—a mask unit 52 is provided. The mask unit 52 has suitably positioned apertures 54, 56 through which the faces 46, 48 of the counters 26, 28 are respectively projected.

As is best illustrated in FIG. 2, the lateral shift between the counters 26, 28 causes their respective projections to be laterally shifted with respect to each other. Lateral shifting of such projections is necessary so that the rotary knives 20 may slit the web 10 between such projections. See FIG. 3.

To assure that reference indicia is evenly positioned along the length of the web; and to assure that the counters 46, 48 are not flashed while their respective counts are going from one count to another, the invention provides a master controller 58, the operation of which controller is slaved to the movement of the web 10 past the projection printer 22: A pulley 60 is mounted on the driver shaft for the metering roll 12, and such pulley 60 cooperates to drive a controller pulley 62 by means of a timing belt 64. The pulley 62 is coupled to drive a shaft 66 mounted in bearings 68, 70 in a U-shaped piece 72. The shaft 66 supports a disk 74 having an aperture 76 therein; and such aperture 76—depending on the angular orientation of the shaft 66—may align with the lamp 78 and photocell 80 combination, or with a lamp 82 and photocell 84 combination. The lamp 78 and photocell 80 are both secured, in alignment, to the U-shaped piece 72; and the lamp 78 may illuminate the photocell 80 via aligned apertures 86, 88 in the piece 72, provided the aperture 76 is aligned with the apertures 86, 88.

The lamp 82 and photocell 84 are mounted, in alignment, on a second U-shaped piece 90. The U-shaped piece 90, which has an aperture 91 in alignment with the lamp 82 and photocell 84 in combination, may be rotated about the axis of the shaft 66; and may be set at a preselected angular orientation with respect to the U-shaped piece 72 by means of a set screw 92. The screw 92 threads into the U-shaped piece 72, and may ride within an arcuate slot 94.

The output signal from the photocell 84 is applied to a pulse shaping and amplifying stage 96, and thence to the stepping motors 32, 36; the output signal from the photocell 80 is applied to a pulse shaping and amplifying stage 98, and thence to the excitation portion of the flash tube 42.

With the relative angular orientation of the U-shaped pieces **72, 90** properly set (by means of set screw **92**), rotation of the disk **74** will cause its aperture **76** repeatedly to see the lamp **82** before such aperture sees the lamp **78**. As the web **10** moves past the projection printer **22**, the rotational speed of the disk **74** is kept in time with the web speed—by virtue of the pulley-and-belt connection (**62, 64, 66**)—thereby to produce pulse trains as indicated in FIG. **4**. Referring to FIG. **4**, the pulse train output from the pulse shaping and amplifying stage **96** indicates that the web speed is—for purposes of illustration—first steady, and then speeded up. As soon as a pulse is applied to the stepping motors **36, 38** by the stage **96**, however, such motors index by accelerating and decelerating from one step to another. The discrete duration required for such acceleration and deceleration is indicated in the middle time-plot of FIG. **4** (A;D); and to be noted is that, regardless of the frequency of the stepping pulses (**96**), the duration for such stepping is constant. By setting (via the setscrew **92**) the relative timing of the flash from the flash tube **42** with respect to the operation of the stepping motors **26, 28**, the flashes in question may be made to occur assuredly after the completion of each discrete counter index; and before respective subsequent indexings of such counters. See FIG. **4**, time-plot **98**. So long as the stepping motor pulses **96** are not any closer than the acceleration-deceleration duration (A;D), each counter **26, 28** has to have its respective count flashed and imaged on the web while such count is stationary. Attendantly, unblurred latent images of such counts appear respectively on the web section **16, 18**; and such is accomplished without the prior art need for counter masking techniques, and the problems which are attendant thereto.

The invention has been described in detail with particular reference to preferred embodiments thereof, but it will be understood that variations and modifications can be effected within the spirit and scope of the invention.

I claim:

1. In a system for imparting latent images of sequential reference indicia along the length of a photographic web, the system including a projection printer past which said web, during manufacture thereof, is transportable, said projection printer having:

a. at least one mechanical counter having a drivable input shaft,

b. means for flashing the face of said counter, and

c. means for projecting said counter face onto said web,

the improvement including:

a. a pulse-responsive stepping motor so connected to drive said counter input shaft that said counter may index from count to count, and

b. controller means operable with both said stepping motor and said means for flashing to pulse first said stepping motor, and then to actuate said flashing means,

said controller means comprising:

a. a pair of relatively rotatable, but fixedly positionable, members, each of which members supports in spaced apart relationship a lamp aligned with a photocell,

b. a disk, having at least one aperture therethrough, said disk being so adapted for rotation that said aperture may align with, and between, the respective lamps and photocells of both said members,

c. means for rotating said disk, and

d. respective means responsive to the output signals from the said photocells of said members respectively to pulse said stepping motor and to actuate said means for flashing.

2. The system of claim **1** including means for rotating said disk in proportion to the rate at which said web is transported past said projection printer.

3. In a system for producing, from a photographic web, at least one pair of narrower photographic web sections, each of which narrower web sections has latent images of sequential reference indicia disposed along its respective length, and which system comprises:

a. means for transporting said web in the direction of its length, and means for slitting said web lengthwise into said web sections,

b. a projection printer, disposed before said means for slitting in the direction that said web in transportable, said projection printer having:

1. a pair of mechanical counters laterally disposed with respect to each other widthwise of the said web,

2. means for flashing the faces of said counters, and

3. means for so projecting the said counter faces onto the surface of said web that, after said web is slit, the indicia on said counter faces respectively appear on the respective web sections,

the improvement comprising:

a. respective stepping motors for indexing the said counters, and

b. means for pulsing said stepping motors and for thereafter actuating the said means for flashing,

said means for pulsing and actuating being adapted to pulse and actuate at a rate proportional to the rate at which said means for transporting conveys said web past said projection printer, and said means for pulsing and actuating comprising:

a. a shaft,

b. first and second U-shaped members adapted to be relatively fixedly positionable about said shaft, said first U-shaped member supporting in spaced-apart relationship a lamp and a photocell, and said second U-shaped member supporting in spaced apart relationship a lamp and a photocell,

c. a disk secured to and drivable by said shaft, said disk having at least one aperture therethrough that, depending on the angular orientation of the disk, allows the lamp of the first U-shaped member to illuminate its corresponding photocell, and the lamp of the second U-shaped member to illuminate its corresponding photocell,

d. means responsive to the rate that said web is transported past said projection printer to drive said shaft, and

e. means for applying the signal output of said photocell on said first U-shaped member to said stepping motors, and for applying the signal output of said photocell on said second U-shaped member to said means for flashing.