United States Patent [19]

Lee

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[54] **PHOTOGRAPHIC PROCESSING MACHINE WITH OPPOSITELY CANTED TRANSPORT ROLLER**

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[73] Assignee: **Pako Corporation,** Minneapolis, Minn.

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[52] **U.S. Cl.** **226/184;** 226/189

[51] **Int. Cl.** **G03d 1/12**

[58] **Field of Search** 226/184, 188, 189, 17

[56] **References Cited**

UNITED STATES PATENTS

3,472,515	10/1969	Kerwin	226/184 X
3,586,229	6/1971	Kamada	226/189 X
3,830,419	8/1974	Lee	226/184

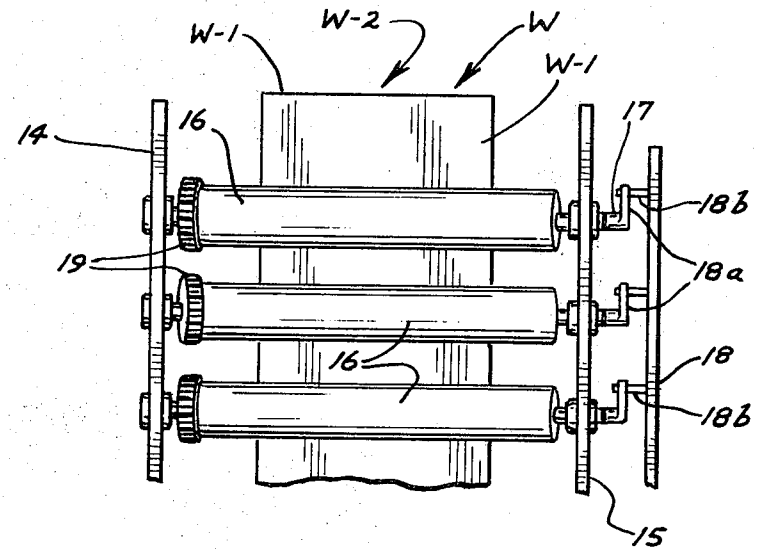
Primary Examiner—Richard A. Schacher

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[57] **ABSTRACT**

This is a photographic processor having a plurality of pairs of cylindrical film transport rollers, the rollers in each pair being parallel to each other but adjacent pairs being respectively canted in opposite directions to produce a zigzag path for the marginal edge portions of the web being transported to limit the area of contact between said web and the rollers to the marginal edge portions of the web.

2 Claims, 5 Drawing Figures



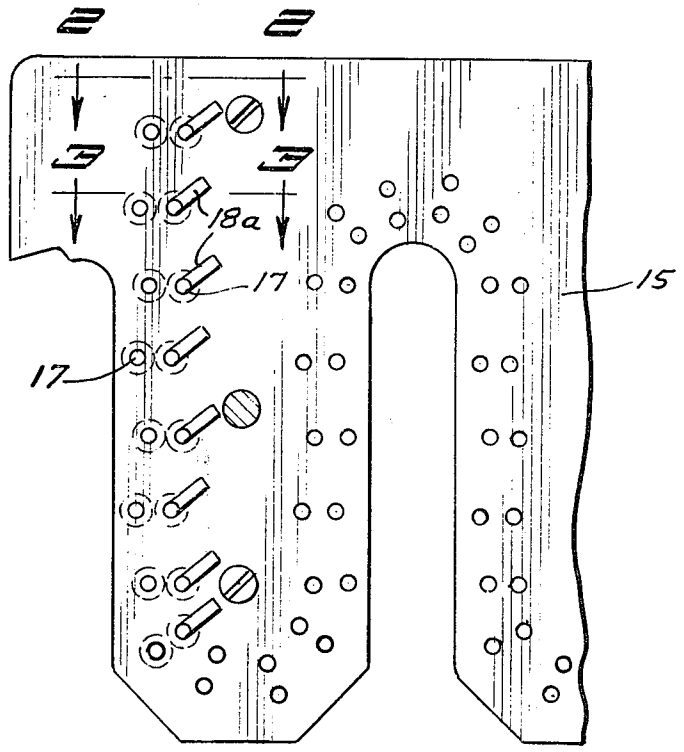


FIG. 1

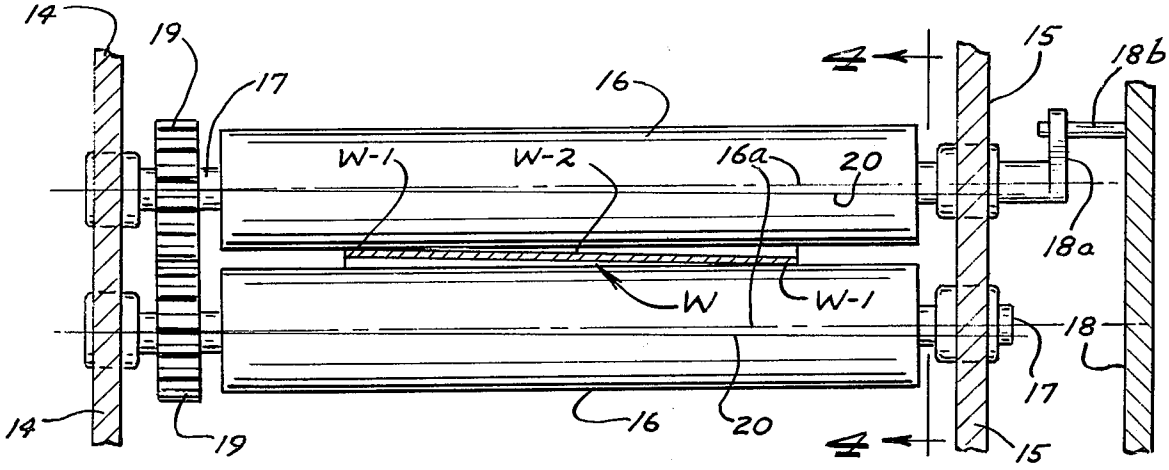


FIG. 2

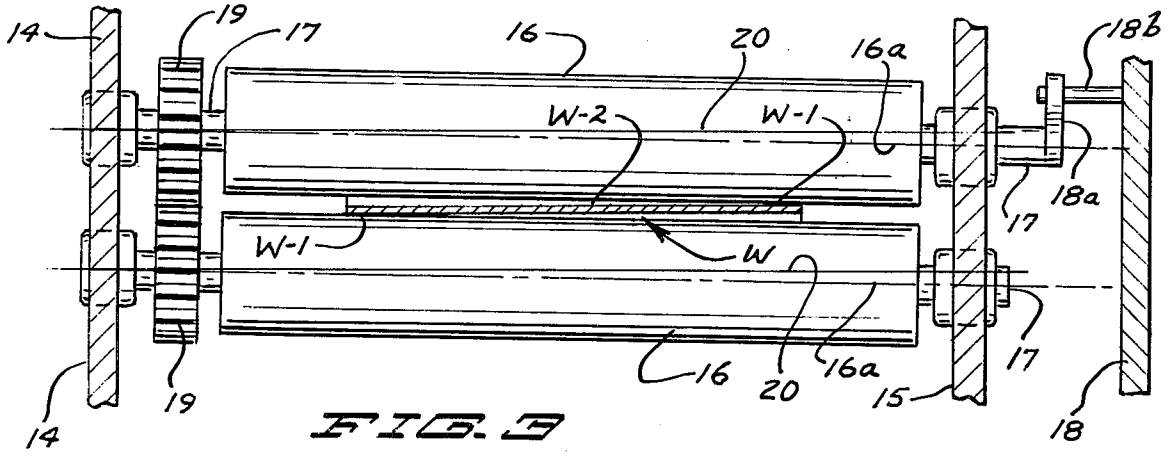
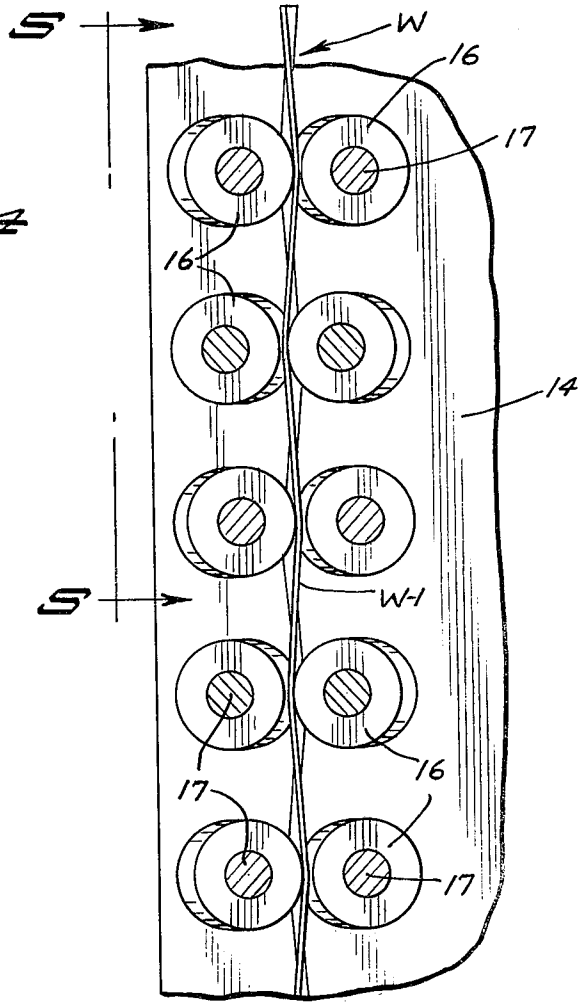


FIG. 3

FIG. 4



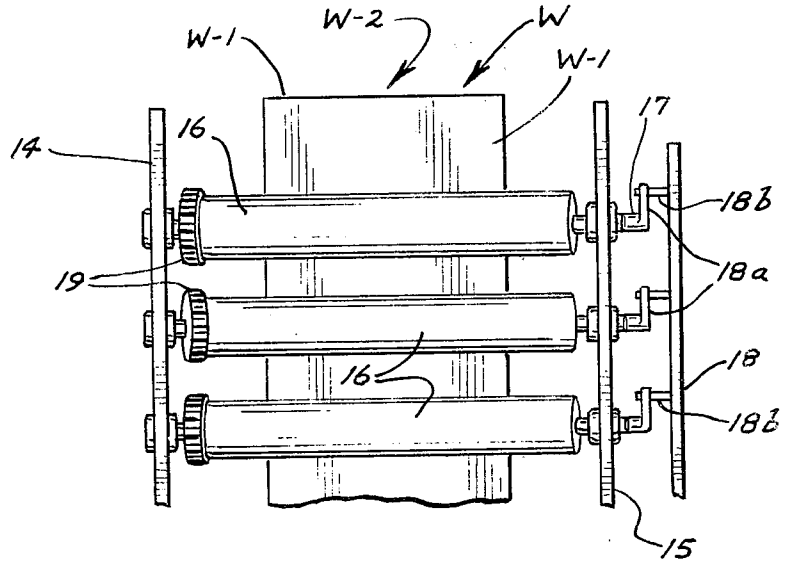


FIG. 5

PHOTOGRAPHIC PROCESSING MACHINE WITH OPPOSITELY CANTED TRANSPORT ROLLER

The tapered roller construction disclosed and claimed in my co-pending application S.M. **391,334** filed Aug. **24, 1973,** now U.S. Pat. No. **3,830,419** effectively produced the desired limited area of contact between the transport rollers and the film strip; however, it was found that the tooling for manufacturing tapered rollers is considerably more expensive than is required for the cylindrical rollers embodied in the present invention, and in addition to this problem, it was found to be difficult to provide sufficient beam strength with longer length tapered rollers to produce the required stability.

It is an object of the present invention to provide a cylindrical transport roller construction for photographic processors which is particularly adapted to be inexpensively manufactured while still providing the limited marginal edge contact between the rollers and the strip or web of photographic film being transported thereby.

It is another object to provide such a transport roller construction which is also adapted to permit manufacturing different length rollers without requiring expensive tooling therefor.

These and other objects and advantages of this invention will be apparent from the following description made in connection with the accompanying drawing wherein like reference characters refer to similar parts throughout the several views, and in which:

FIG. **1** is a fragmentary side elevational view showing a portion of a roller rack for a photographic processor embodying this invention (with the oscillating plate removed);

FIG. **2** is a horizontal sectional view taken substantially along the line **2—2** of FIG. **1** but showing a portion of the oscillating plate in operative position;

FIG. **3** is a horizontal sectional view taken substantially along the line **3—3** of FIG. **1** also showing the oscillating plate;

FIG. **4** is a fragmentary vertical sectional view taken substantially along the line **4—4** of FIG. **2**; and,

FIG. **5** is a fragmentary end elevational view showing three (**3**) pairs of typical rollers.

A portion of a roller rack for a photographic film processor which embodies this invention is best shown in FIG. **1.** The rack illustrated includes a web transport mechanism which has a pair of parallel fixed side panels or mounting plates respectively designated by the numerals **14** and **15.** This roller rack is removably mounted in conventional processing tanks (not shown) similar to those described in my previously identified co-pending application (Ser. No. **391,334**) now U.S. Pat. No. **3,830,419.**

The present transport mechanism includes a plurality of pairs of cylindrical film transport rollers **16** with the rollers of each pair having parallel axes. Each roller **16** is fixed to a supporting shaft **17** which is mounted for rotation between the pair of mounting plates **14** and **15.** The ends of adjacent pairs of rollers **16** are respectively offset in opposite directions to cant the axes thereof into oblique (out of normal) relation to the planes of the plates **14** and **15.** The relationship is best shown in FIGS. **2** and **3** by the center lines **16a** of the rollers **16** and the lines **20** which are disposed normal to the planes of the plates **14** and **15.** This produces the desired "zigzag" path of the two marginal edge portions W-1 of the web of photographic material W, thus limiting the area of contact with the rollers to said marginal edge portions.

As is set forth in my above identified co-pending application (Ser. No. **391,334**) now U.S. Pat. No. **3,830,419,** any suitable means for imparting rotary driving motion to the rollers **16** may be provided such as the DRIVING MECHANISM FOR ROLLER TRANSPORTING DEVICE disclosed in U.S. Pat. No. **3,608,807.** This mechanism includes an oscillating plate **18,** best shown in FIGS. **2, 3** and **5.** One shaft **17** of each pair of rollers has a crank arm **18*a*** fixed in radially outstanding relation thereto and these crank arms **18*a*** are respectively engaged by crank pins **18*b*** fixed in outstanding relation to said oscillating plate and driven thereby in the manner set forth in said prior patent. Instead of the two oscillating plates **40** and **42** disclosed in said patent, the present mechanism includes only one such plate which is designed to drive only one of each pair of rollers. In the mechanism disclosed herein, the other roller in each pair is driven by a pair of meshed gears **19** respectively fixed to the ends of the shafts **17** opposite to the ends to which the crank arms **18*a*** are fixed. This is best shown in FIGS. **2, 3** and **5.**

As in my prior co-pending application, the rollers are oriented in such a manner as to define a continuous web path through the processing tanks (not shown) and the marginal edge portions W-1 of the web follow a zigzag path as shown in FIG. **4.** The opposed surfaces of the rollers **16** are spaced apart a distance greater than the thickness of the web W of material being transported and center portion W-2 of the web W is out of contact with the rollers as best shown in FIGS. **2** and **3.**

The alternating of the direction of the roller axis angle of adjacent pairs of rollers not only produces the zigzag path of the marginal portions of the web as described, but also maintains the web W in transversely centered relationship along the center line of its desired web path.

Since the spacing between the rollers of each pair is wider than the thickness of the web being transferred as in my prior application, it has been found to be desirable to provide a pair of squeegee rollers (not shown) at the top of the exit portion of the web path above each liquid confining tank. These squeegee rollers are in surface contact and are positioned above the liquid level of each of the liquid tanks. They are of soft yieldable material and are positioned to press against both sides of the web to "squeegee off" substantially all of the liquid from the surface of the web W as it is transported out of each tank.

It will be seen that the opposite orientation of adjacent rollers produces an offset of both marginal edge portions of the web thus causing a tensioning of edge portions to provide maximum drive pressure therealong and eliminate the driving contact pressure on the central image-bearing areas of the web. The requirement for close tolerances of the spacing between each pair of rollers **17** has also been eliminated.

It will, of course, be understood that various changes may be made in the form, details, arrangement and proportions of the parts without departing from the scope of this invention as set forth in the appended claims.

What is claimed is:

1. In a photographic processor, a mechanism for transporting elongated webs of photographic sheet material through the processor, said transport mechanism comprising:

a roller supporting structure,

a plurality of pairs of cylindrical transport rollers mounted on said structure and arranged to define a continuous web path through the processor,

the spacing between the rollers of each pair being greater than the thickness of the web to be transported and the rollers of each pair being parallel to each other,

adjacent rollers being oppositely canted to produce a zigzag path for the marginal edge portions of a web of material being transported through said rollers and limit the contact between the web and the rollers to only the marginal edge portions of the web, and

means for driving said rollers to transport a web through the processor along the desired path therein.

2. The structure set forth in claim 1 and said roller supporting structure comprising,

a pair of spaced apart mounting plates with each roller extending therebetween and having the roller ends journaled for rotation on the respective plates, the canted relation of the rollers being produced by orienting the axes thereof in oblique relation to the planes of said mounting plates.

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