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2,788,587

APPARATUS FOR STRIP MATERIAL

Filed June 1, 1954

4 Sheets-Sheet 1

FIG. 1.

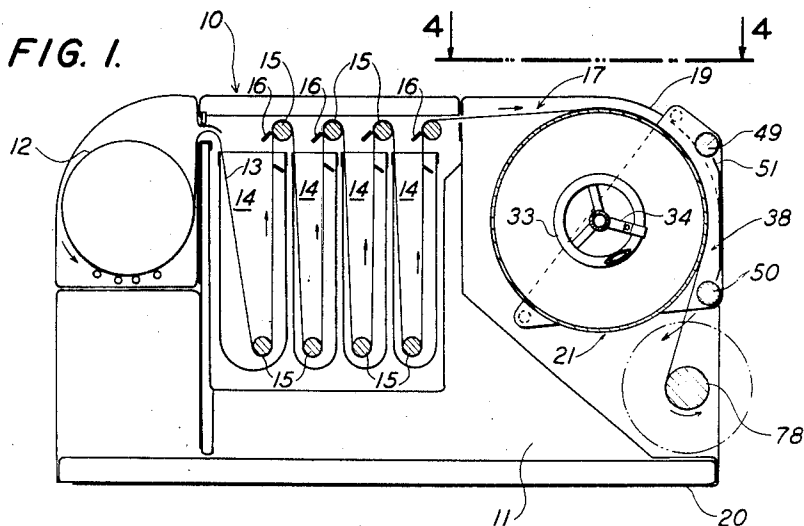


FIG. 2.

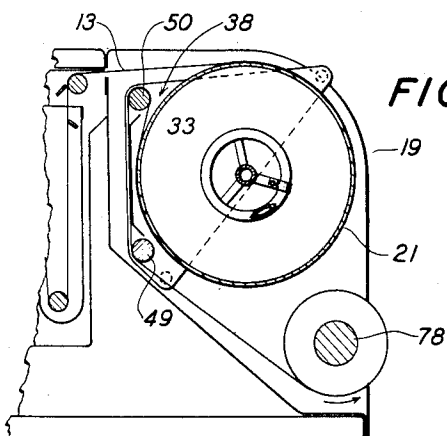


FIG. 9.

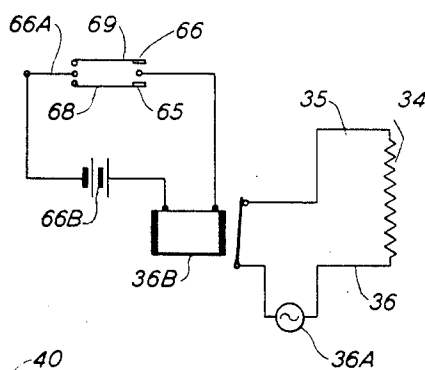
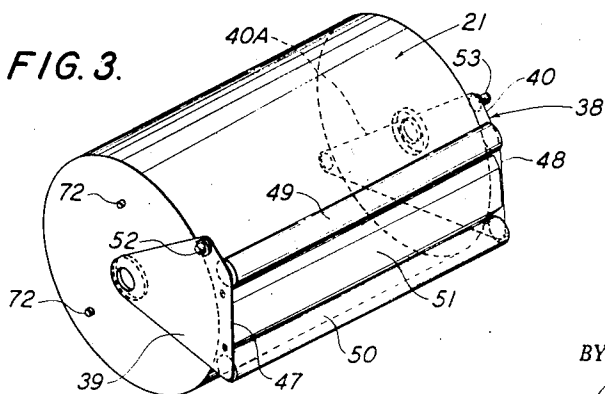


FIG. 3.



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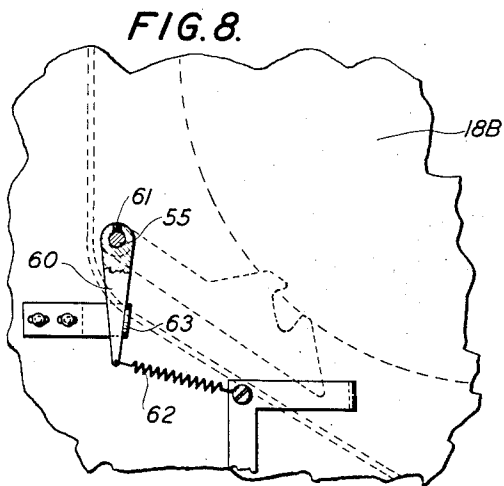
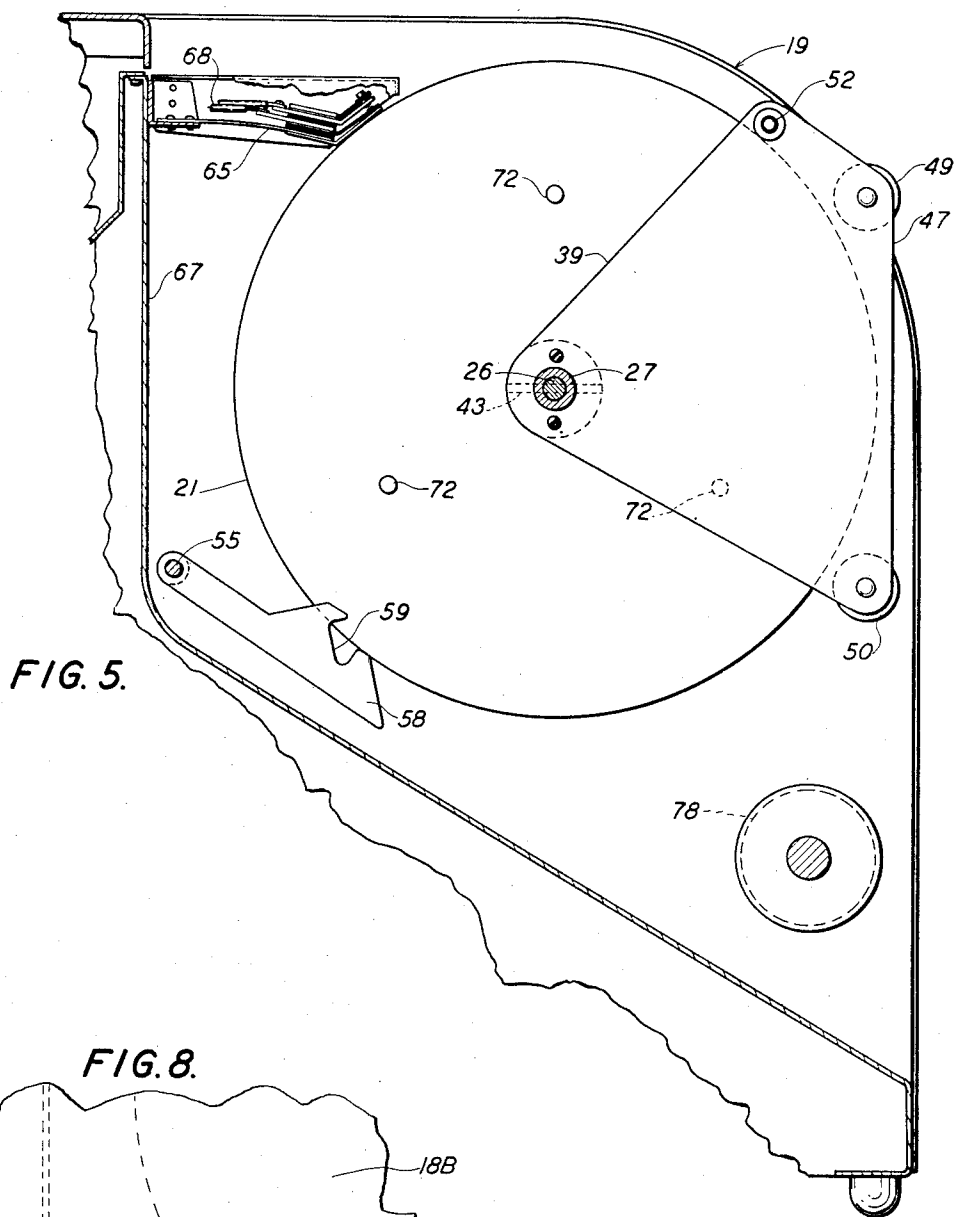
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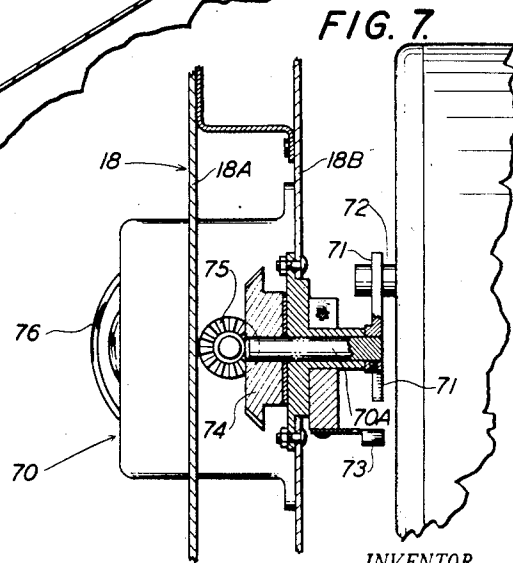
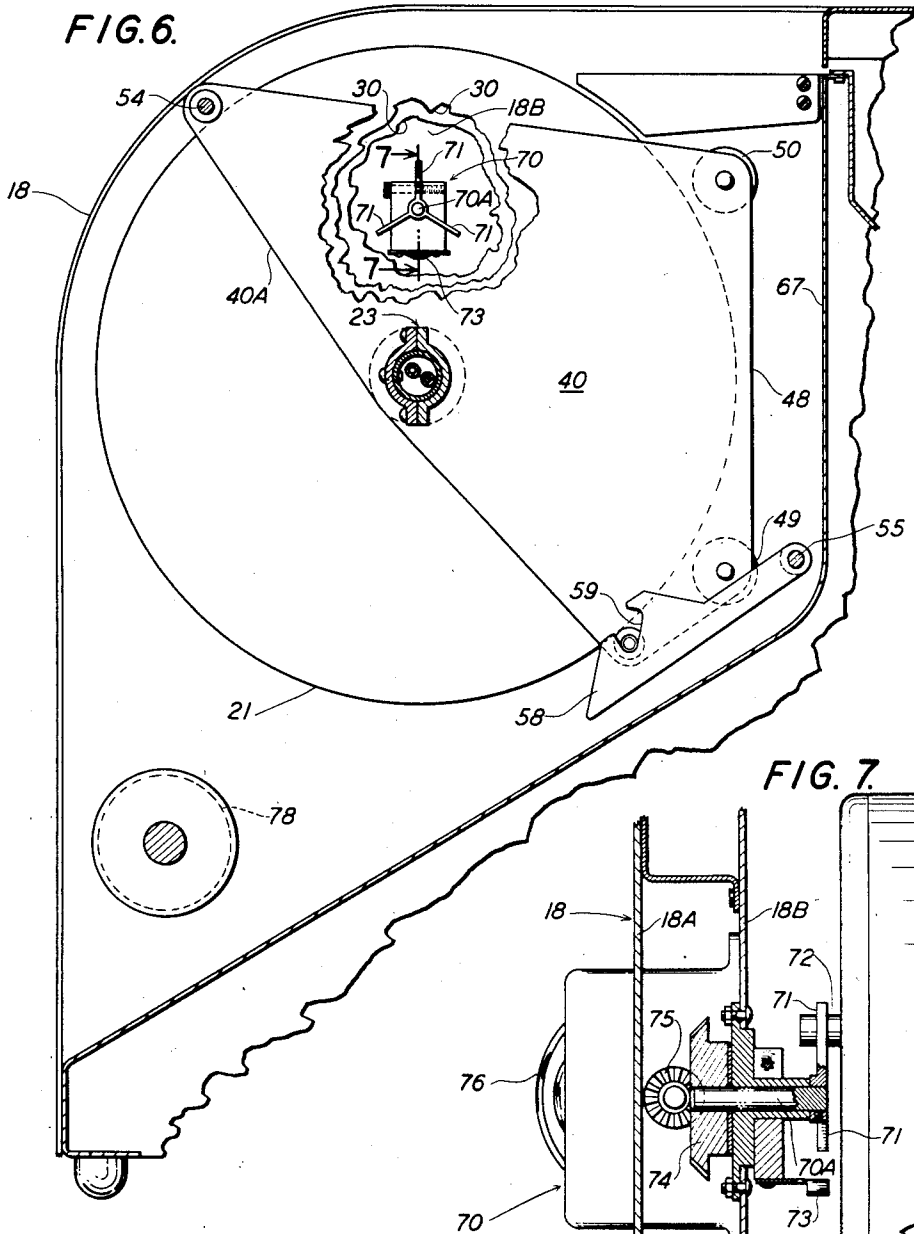
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APPARATUS FOR STRIP MATERIAL

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APPARATUS FOR STRIP MATERIAL

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Application June 1, 1954, Serial No. 433,701

3 Claims. (Cl. 34—110)

This invention relates to apparatus for treating strip material and more specifically to apparatus in which strip material such as photographic paper is passed around a treating drum.

In many types of processes it is often desirable to pass strip material around the periphery of one or more drums while the material is being treated, e. g., heated, degassed, coated, irradiated, etc.

For economy and compactness of construction it is desirable to pass the strip material around as much of the treating drum periphery as practical. It is also desirable to have auxiliary rollers associated with the treating drum arranged for threading or loading of the strip material with a minimum of difficulty. This invention provides a treating drum and associated roller means which permit the use of a large part of the treating drum periphery and in addition permit the threading or loading of the strip material around the drum with minimum difficulty.

The present invention contemplates apparatus for treating strip material in which a treating drum is disposed so that the strip material can be passed around a substantial part of its periphery. Conveniently, the strip material is taken from storage on a reel or in a magazine, passed around the treating drum, and then stored on a take-up spool driven by conventional means. A roller is located adjacent the drum periphery with its longitudinal axis extending in the same direction as the longitudinal axis of the drum. The roller is disposed near the point where the strip material first enters onto the drum periphery so that the strip material passes around substantially all of the drum periphery, between the drum periphery and the roller, and around a portion of the roller periphery.

In a preferred form of the invention, the roller is mounted on a bracket which extends transverse to the longitudinal axis of the drum. One end of the bracket is adapted to pivot about an axis parallel to the longitudinal axis of the drum. The other end of the bracket carries a roller adapted to guide the strip material around a substantial portion of the drum. Means are provided for releasably holding the bracket in two fixed positions located approximately 180° apart around the drum periphery. When the bracket is held in the first or loading position, the roller is adjacent the drum periphery and located near the point where the strip material first contacts the drum periphery but is spaced from that point in the direction in which the strip material passes around the drum. Strip material is passed between the drum and the roller while it is held in the loading position and the bracket is then rotated to carry the roller around the drum periphery in the direction of movement of the strip material, the leading end of the strip material being held in a fixed position so that the strip material is carried around a substantial portion of the drum, and the bracket is then locked in the second or operating position. For

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convenience in guiding the treated material two or more rollers may be disposed about the drum periphery.

In those processes in which the invention is to be used for heating the strip material, means are provided for heating the drum or strip material as it passes around the drum. In addition, temperature-sensing means, such as a thermostat, is used to measure the drum temperature and automatically control the heating means to maintain the drum temperature substantially constant.

As indicated above, this invention is suitable for use in a variety of processes in which strip material is passed over a drum for treatment. However, for the purposes of illustrating the invention in detail, a preferred form of the apparatus is described as used in conjunction with apparatus for developing relatively long strips of photographic paper in which the treating drum is used to dry the paper after it is immersed in various solutions. More specifically, the apparatus is generally known as an oscillogram processor, i. e., apparatus for developing and immediately drying and storing a strip of photographic paper which has been used to record the output of an oscillograph.

These and other aspects of the invention will be more clearly understood in the light of the following detailed description taken in conjunction with the accompanying drawings in which:

Fig. 1 is a schematic sectional view of the invention as adapted for use in drying developed photographic paper in an oscillogram processor, the bracket being held in the loading position;

Fig. 2 is a partial schematic section of the apparatus illustrated in Fig. 1 showing the bracket held in the treating position;

Fig. 3 is a perspective view of the treating drum, the bracket, and associated guide rollers;

Fig. 4 is a plan view taken along line 4—4 of Fig. 1, partly broken away and partly in section;

Fig. 5 is a sectional elevation partly broken away taken on line 5—5 of Fig. 4;

Fig. 6 is a sectional elevation, partly broken away taken on line 6—6 of Fig. 4;

Fig. 7 is a partial transverse section taken on line 7—7 of Fig. 6 showing the details of a counter which indicates the amount of strip material treated;

Fig. 8 is a view taken on line 8—8 of Fig. 4 showing the means for releasably holding the roller bracket; and

Fig. 9 is a schematic circuit diagram of a circuit showing how the heating means is controlled thermostatically.

Referring to Fig. 1, an oscillogram processor is indicated generally by the reference character 10, and comprises a substantially rectangular case 11 having conventional means for holding a roll 12 of photographic paper 13 in the forward end of the case, a series of developing tanks 14 and developer rollers 15 associated with the tanks for guiding the photographic paper serially through the tanks located in an intermediate, light-tight compartment of the case, a plurality of squeegees or wipers 16 for reducing the liquid transfer from one tank to the following tank as the paper is processed, and a treating or drying section 17 in the rear end of this case.

The rear end of the case or the drying section is provided only with side walls 18, 19 (see Fig. 4) and a bottom 20 which extends for the entire length of the case. Each of the side walls is formed of two parallel partitions 18A, 18B and 19A, 19B, respectively. The top and rear end walls are omitted from the drying area to facilitate the circulation of air to increase the drying rate of the wet paper. A drum 21 is rotatably supported in the drying section with its longitudinal axis extending transverse to the side walls. A stationary, hollow shaft 22, supported at one end by a split-flanged hub 23 mount-

ed in the wall 19 of the case, extends coaxially through the drum. The shaft is attached to the hub by a screw 24. The other end of the shaft is provided with an internal pilot bearing 25 into which extends an end of a crankshaft 26 journaled through a bearing 27 in the wall 18 of the case. A crank handle 28 positioned on the outside of the case is attached to the other end of the crankshaft.

Each end of the drum is provided with an inner wall 29 and an outer wall 30 which acts as a heat shield. The drum is rotatably supported about the hollow shaft by an annular drum bearing 31 in the center of each drum end wall which is respectively disposed about a shaft bushing 32 on each end of the shaft.

A helical heating coil 33 is coaxially disposed about the shaft within the drum and is supported by a pair of spiders 34 attached to the shaft. Two power lines 35, 36 are attached to the respective ends of the heating coil and extend through the interior of the shaft and out an opening in the wall 19 of the case, and are adapted to be connected to a conventional power source 36A (see Fig. 9) through a relay 36B.

A bracket 38 having parallel end plates 39, 40 extending transverse to the hollow shaft between the drum and case walls 18, 19, respectively, is adapted to pivot about the shaft. A first annular plate bearing 42 is disposed about the crankshaft adjacent the end wall of the drum. This bearing is attached to the crankshaft by means of a pin 43 extending through the bearing and the shaft. The inner portion of plate 39 is attached to the bearing by means of screws 44. A second end plate bearing 45 is disposed about the hollow shaft adjacent the other end wall of the drum. An inner portion of the end plate 40 is attached to the second plate bearing by screws 46. Each end plate 39, 40 is provided with a straight edge 47, 48 respectively. The edges extend in the same direction and are disposed slightly beyond the drum periphery. A first roller 49, parallel to the drum axis, is rotatably attached between one pair of ends of the two plate edges. A second roller 50, parallel to the first, is rotatably attached between the other pair of ends of the straight edges. A back-up plate 51 is attached to the end plates between the two rollers and lies in the plane defined by the two rollers.

An operating locking pin 52 is provided on the outer surface of end plate 39 near the first roller and extends toward the end case wall 18. A similarly-located operating locking pin 53 is provided on the outer surface of end plate 40 and extends toward the case wall 19. The end plate 40 is provided with an extension 40A which projects beyond the drum periphery to a position diametrically opposed to the operating locking pin position. A loading locking pin 54 extends from the outer surface of this projection of the end plate 40. Thus, all of the locking pins travel around the periphery of the drum as the bracket is pivoted or rotated.

A latch shaft 55 extends through the side walls of the case just to the rear of the drum and slightly below the axis of drum rotation. A latch handle 56 is attached to the end of the latch shaft extending through the wall 18 and the other end of the shaft is rotatably secured to the opposite wall by means of a locking nut 57. Each end of the latch shaft is provided with a latch arm 58 rigidly attached to the shaft adjacent the inside of each side wall by means of set screws 58A. Each latch extends downwardly and to the rear of the case. A latching notch 59 is provided in the free ends of each of the latch arms and is adapted to receive and releasably hold the locking pins as the bracket is rotated by means of the crank.

One end of a downwardly extending lever arm 60 (see Fig. 8) is attached by means of a screw 61 to the latch shaft within wall 18. One end of a tension spring 62 is attached to the free end of the lever and the other end of the tension spring is attached to a screw mounted within the wall. A stop 63 is mounted on the wall so that the spring tends to hold the lever against the stop. Thus,

the latches are held up until moved down by operation of the handle attached to the latch shaft.

A pair of conventional thermostats 65, 66 are attached to a rear wall 67 of the case and extend rearwardly to contact the upper-rear portion of the drum periphery. For flexibility of drying paper under various conditions, one of the thermostats is set for operation at high temperatures and the other is set for operation at a lower temperature. Each of the thermostats are adjustable for operation at any desired temperature within their respective operating ranges. The thermostats 65, 66 are respectively connected by leads 68, 69 through a double-pole switch 66A and a relay battery 66B to the relay coil whereby one or the other of the thermostats regulates the power supplied to the heating coil and thus maintains the drum at substantially a constant temperature.

A conventional counter 70 (see Figs. 6 and 7) is attached in side wall 18. One end of a counter shaft 70A extends into the case through the inner partition of wall 18 and is provided with three prongs 71 positioned 120° apart and extending transverse to the counter shaft axis. Three projections 72 spaced 120° apart are provided on the end of the drum adjacent the counter and engage the prongs as the drum is rotated. A spring detent 73 under the counter shaft successively engages the prongs and prevents the shaft from overrunning. A bevelled gear 74 attached to the end of the shaft within the wall is rotated as the prongs are engaged by the projections on the drum. This gear engages a smaller bevelled gear 75 which operates the counter. A reset knob 76 is provided so that the counter may be set as desired. Thus the counter provides an accurate measure of the amount of strip material which has been passed over the drum. This is particularly useful in determining how much paper has been processed and when the chemicals in the various baths need to be replaced.

A winding or take-up spool 78 is rotatably mounted at the lower rear portion of the case and is rotated by conventional means (not shown).

The operation of the apparatus is as follows:

The crank is turned to the position shown in Fig. 4 so that the rollers are in the loading position. With the bracket in this position, the loading locking pin is held by the notch in the latch arm adjacent the side wall 19. The leading end of the strip paper to be processed is passed over the top of the drum periphery and guided down between the drum periphery and the two rollers. The end of the paper is then attached to the take-up spool. The latch shaft handle is depressed to rotate the latches in a clockwise direction, as viewed in Fig. 5, so that the loading locking pin is released. The crank handle is then rotated so that the bracket turns clockwise (as viewed in Fig. 1) for approximately 180° to the position shown in Fig. 2. The bracket is held in this second position by means of the two operating locking pins, each of which respectively engages in the notches in the latch arms. The additional length of paper necessary for this new position is pulled from the magazine as the bracket is rotated. Thus the paper is carried around approximately 300° of the drum periphery (see Fig. 2) before it is wound on the take-up spool.

The driving means for the take-up spool is then turned on and the paper is pulled from the magazine, through the various tanks, over the heated drum for a final drying operation, around the rollers while supported by the back-up plate, and then on to the take-up spool. Thus the paper is dried and stored in one continuous operation as soon as it is developed. This is accomplished with a drum of minimum size and with minimum difficulty of loading due to the use of the "wrap-around" rollers of the invention.

As indicated above, the temperature of the drum can be adjusted by setting the thermostats for various requirements, depending on the type of paper being processed and the local conditions, such as humidity and temperature.

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The present invention has been used satisfactorily to dry typical photographic paper at the rate of ten feet per minute, operating the drum at a temperature in a range between 280° F. and 350° F.

The apparatus could be arranged so that the bracket is permanently held in the operating position, thus doing away with the pivotal feature of the bracket. This would result in the strip material covering the same amount of drum periphery, but the loading or threading of strip paper around the drum and between the drum and rollers would be more difficult, particularly when the drum is maintained at operating temperature for continual use.

I claim:

1. In apparatus for treating strip material the combination comprising a treating drum adapted to rotate about its longitudinal axis, a bracket extending transverse to the axis of rotation of the drum and adapted to pivot about the axis of rotation of the drum, a first roller carried by a portion of an end of the bracket and disposed adjacent the drum periphery at a first location, the longitudinal axis of the first roller extending parallel to the axis of rotation of the drum, a second roller extending in the same direction as the first roller and carried by another portion of the same end of the bracket, the second roller being adjacent the drum periphery at a second location, means for releasably holding the bracket in a first fixed position and in a second fixed position, and means for moving the strip material around a substantial portion of the drum periphery, between the drum and the rollers and around a portion of each of the roller peripheries when the bracket is held in the second position, the first roller being near the point on the drum which is first contacted by the strip material and the second roller being farther removed from the said point of first contact.

2. In apparatus for treating strip material the combination comprising a treating drum adapted to rotate about its longitudinal axis, a bracket extending transverse to the axis of rotation of the drum and adapted to pivot about the axis of rotation of the drum, a first roller carried by a portion of an end of the bracket and disposed adjacent the drum periphery at a first location, the longitudinal axis of the first roller extending parallel to the axis of rotation of the drum, a second roller extending in the same direction as the first roller and carried by another portion of the same end of the bracket, the second roller being adjacent the drum periphery at a second location, means for alternately releasably holding the bracket in a first fixed position and in a second fixed position including locking pins affixed to the bracket and at least

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one latch arm pivoted apart from the drum and bracket and having a latching notch adapted to receive and releasably hold the locking pins, and means including a crank handle having a crankshaft connected to the bracket on the axis of rotation of the bracket for rotating the bracket from the first to the second position so that the strip material is moved around a substantial portion of the drum periphery, between the drum and the rollers and around a portion of each of the roller peripheries, the first roller being near the point on the drum which is first contacted by the strip material and the second roller being farther removed from the said point of first contact when the bracket is in the second position.

3. In apparatus for treating strip material which includes a treating drum adapted to rotate about its axis, and a take-up spool located proximate the drum, with the strip material entering onto the drum and extending around a portion of the drum periphery and thence to the take-up spool, the improvement which comprises a bracket which encompasses substantially the width of the drum and which is pivotably mounted on approximately the same axis as the drum, the bracket including a pair of rollers oriented approximately parallel to the axis of the drum and spaced apart and extending in the direction across the width of the drum with the rollers being spaced from the periphery of the drum, means for releasably retaining the bracket in a first position in which the rollers are free of the strip material with the strip material passing beneath both rollers and on the drum, means for pivoting the bracket from said first position around the drum and passing the rollers between the drum and take-up spool for carrying a loop of the strip material around the periphery of the drum to a second position which is proximate the point where the material first enters onto the drum, in which second position the strip material passes around the drum and under both rollers thence back over both rollers to the take-up spool, and means for retaining the bracket in said second position.

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