Sept. 11, 1934. E. BLEIBLER 1,973,245

APPARATUS FOR DRYING CELLULOSE FILMS AND THE LIKE

Filed Nov. 29, 1930 3 Sheets-Sheet 1

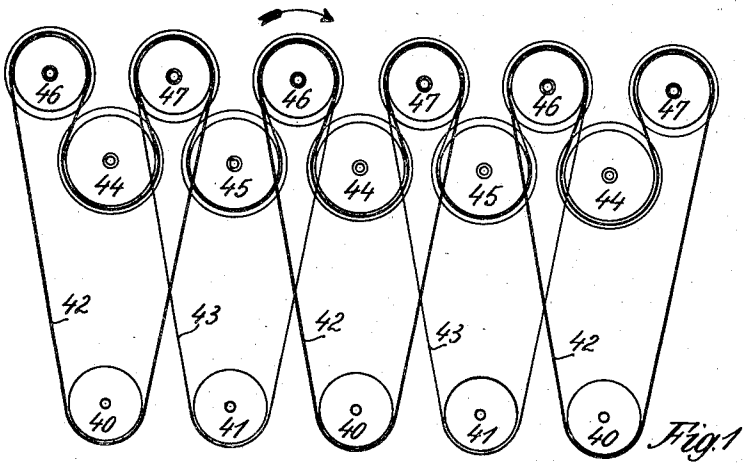


Fig. 1

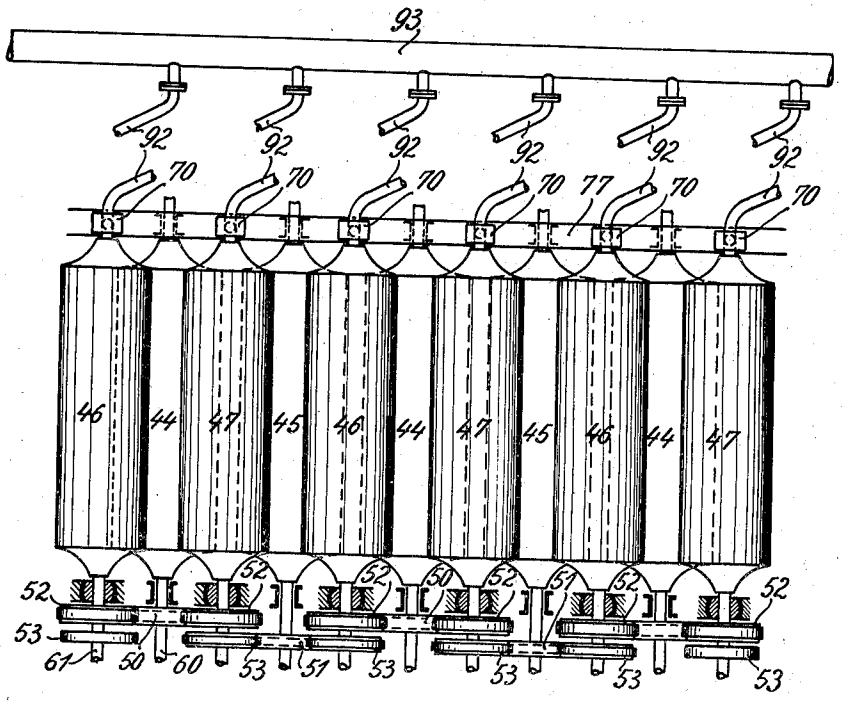


Fig. 2

Inventor:
Ernst Bleibler,
by Byrnes, Townsend & Potter,
Attorneys.

Sept. 11, 1934. E. BLEIBLER 1,973,245

APPARATUS FOR DRYING CELLULOSE FILMS AND THE LIKE

Filed Nov. 29, 1930 3 Sheets-Sheet 2

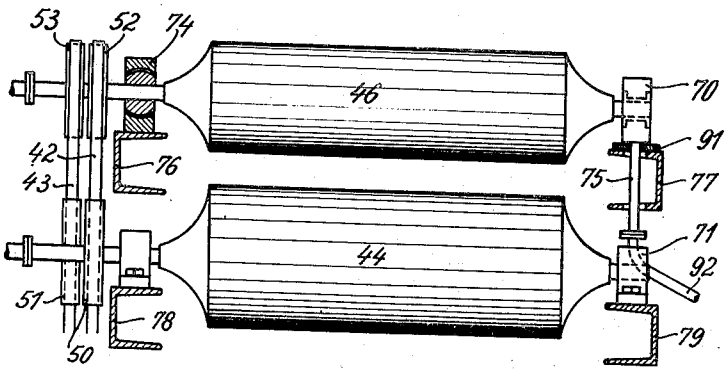


Fig. 3

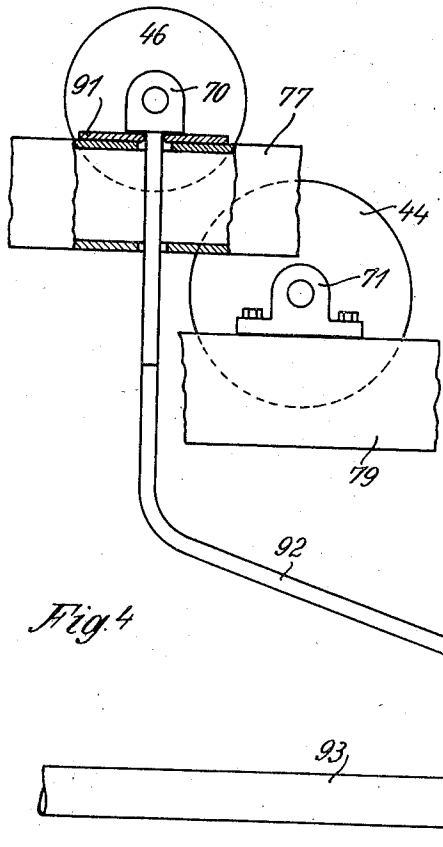


Fig. 4

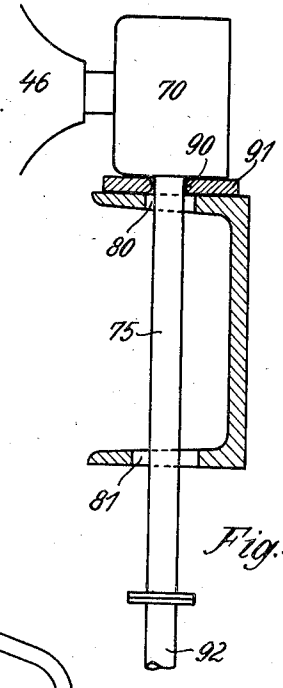


Fig. 5

Inventor:
Ernst Bleibler,
by Byrnes, Townsend & Porter,
Attorneys.

Sept. 11, 1934. E. BLEIBLER 1,973,245

APPARATUS FOR DRYING CELLULOSE FILMS AND THE LIKE

Filed Nov. 29, 1930 3 Sheets-Sheet 3

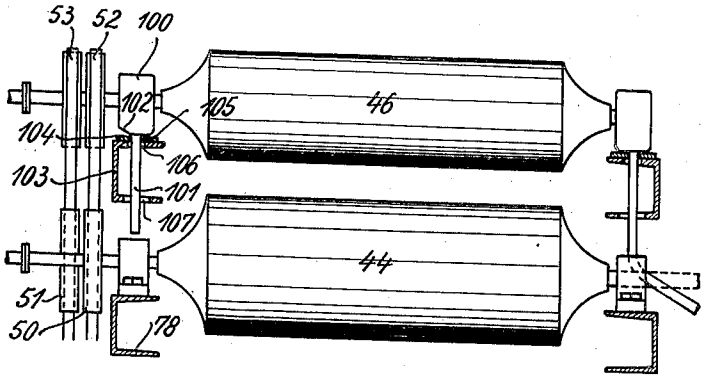


Fig. 6

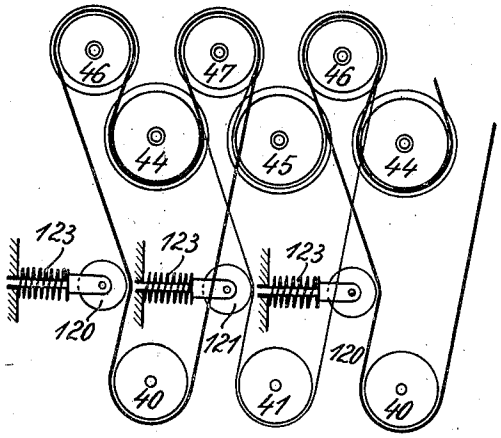


Fig. 7

Inventor:
Ernst Bleibler,
by Byrnes, Townsend & Potter,
Attorneys.

Patented Sept. 11, 1934 1,973,245

UNITED STATES PATENT OFFICE

1,973,245

APPARATUS FOR DRYING CELLULOSE FILMS AND THE LIKE

Ernst Bleibler, Winterthur, Switzerland, assignor to Sylvania Industrial Corporation, Fredericksburg, Va., a corporation of Virginia

Application November 29, 1930, Serial No. 499,089
In Germany December 14, 1929

5 Claims. (Cl. 34—48)

This invention relates to drying plants for the manufacture of cellulose films, strips, webs and the like of cellulose, including regenerated cellulose, the film being supported by a train of drying rollers alternately on one side and on the other side and immediately on the surface of the rollers, the train consisting of an upper tier and a lower tier of rollers and the roller drives being adapted to yield under the stress of abnormal forces developing in the operation of the apparatus.

Particularly the invention relates to such an apparatus in which second drives for those yieldable rollers are provided which likewise are adapted to yield under the stress of abnormal forces, the first and the second drives being arranged to compensate slippage of the drives under normal conditions.

The object of the present invention is to provide a drying apparatus designed in such a manner that breakdowns or disturbances in the working of the plant, such as the breaking of the cellulose strip, may be repaired without stopping the train of rollers.

A further object of my invention is to arrange the drying rollers in such a way that they are automatically able to give way when subjected to undesired forces developing in the operation of the apparatus, for instance such as are caused by irregularities in the thickness of the film, and thus to prevent injury to the film, the plant or the attendants.

More particularly my invention relates to an arrangement which enables adjacent rollers, for instance the top rollers and the bottom rollers, to be removed from each other, that is, separated, without the necessity of stopping the plant.

Further objects of my invention are to provide suitable bearings for the rollers for permitting such separation of the latter and to improve the arrangement of the roller drive.

A still further object of my invention is to improve the supply of the heating or cooling agents to the rollers.

According to this invention the bearings of at least one side of the rollers are loosely mounted on their rigid bases, thus accommodating the spacing apart of the rollers of one tier from the rollers of the other tier, and the rollers of the upper tier are provided at their ends remote from the loosely mounted bearings with tiltably mounted bearings to accommodate tilting of the upper tier about an axis arranged substantially in the direction of the roller train, whereas the bearings on at least one side of the upper tier are provided with guiding means for accommodating movement of the bearings in a substantially vertical plane only.

In the drawings affixed to my specification and forming part thereof a number of embodiments of my invention are illustrated by way of example. It will be readily understood, however, that my invention is by no means limited to these constructions and that the scope of my invention and the ambit of my appended claims extend to any construction incorporating the broad principle underlying my invention.

In the drawings:

Fig. 1 is a diagrammatic front view of a train of rollers according to my invention,

Fig. 2 is a plan of the train of rollers shown in Fig. 1,

Fig. 3 is a side-elevation of a pair of rollers of the train of rollers according to Fig. 2,

Fig. 4 is a rear view of Fig. 3 on an enlarged scale,

Fig. 5 is a detail of Fig. 3 on an enlarged scale,

Fig. 6 is a side-elevation, and

Fig. 7 a front-elevation of a further embodiment of my invention.

Like parts are indicated by like numerals of reference in the various figures of the drawings.

Referring to Fig. 1, it will be seen that pulleys 40, 41 drive by belts 42, 43 groups or sections of rollers each consisting of three rollers, drums or cylinders, viz. the bottom roller 44 and 45 resp. and the top rollers 46, 47. As described in my pending patent application, Serial No. 448,337, a pulley 50 and 51 respectively is mounted on the trunnion or shaft extension of the roller 44 and 45 respectively, while on the trunnions of the top rollers there are mounted two pulleys 52, 53, one of which, for instance 52, belongs to the drive 40, 42, the other, 53, to the drive 41, 43. Thus in the example illustrated all top rollers are directly, and the bottom rollers are indirectly controlled by the general drive and by a special drive so that undesired mutual movements of the rollers are avoided which might arise between the rollers of the adjacent groups as well as of the roller train itself or the sections of the train of rollers.

In the example illustrated, in which the drive as well as the separate drive are located on the same side of the train of rollers, the removing of the rollers from each other is rendered possible by the top rollers being adapted to be swung around an axis extending in the direction or substantially in the direction of the train of rollers. This axis may be arranged on the drive side if the drive and the special driving arrangement of

the rollers respectively are so designed that they permit of a certain side movement taking place. This is, for instance, the case then if, as in the example illustrated, a belt drive is employed or any other gear movable or resilient in the way desired.

The proper tilting movement of the rollers then takes place in the example illustrated on the side for attending the machine opposite to the drive.

A simple and favorable construction results if the rollers in order to enable them to be removed or lifted are journaled in sliding guides extending in the lifting direction, for instance if the sliding guide is provided on the bearings of the rollers. For this purpose the bearing 70 of the roller 46 adapted to be lifted in the example illustrated in Figs. 3 to 5 is provided with a pin or stem 75 which enters into suitable openings, bores or the like of the bar supporting the bearings. In the example illustrated U-girders 76, 77, 78, 79 serve as bearing bars, of which the girder 77 located at the attendance side of the top roller adapted to be lifted off at this side is designed as sliding guide cooperating with the stem of the bearing by providing in said girder 77 directly beneath the bearing 70 vertically aligned transverse slots 80, 81 in the upper and lower flanges, respectively, of the girder through which slots the pin 75 passes. Since the lifting off takes place in this example by tilting one end of the top roller, the openings 80, 81 for the passage of the stem show adequate clearance so that the pin may carry out its movements in an entirely unrestricted manner. Above the girder and in the vicinity of the head of its opening for the reception of the pin this pin is surrounded by a circular opening 90 which is, for instance, arranged in a washer 91. This washer-opening allows the pin to pass freely upwards, and, together with the clearances of the openings 80, 81, admits of a movement of the pin within the washer and thus permits of all movements necessary for lifting this end of the roller, but on the other hand safeguards the bearing against lateral movements which might be caused by forces existing in regular service.

The bearing rests upon the sliding guide by its weight. Thus with the machine in operation it is kept down by the weight of the roller as well as the pull of the film developing in regular service and due to the washer with the circular or otherwise rounded profile it is unable to follow any lateral movements developing in operation. On the other hand the roller may be easily raised for passing and rethreading the broken film and it is furthermore able to give way in the event of disturbing stresses or forces developing when foreign bodies happen to get between the rollers so that injury to attendants accidentally getting with their limbs between the rollers is effectively avoided.

My improved arrangement thus ensures unyieldingness of the rollers during regular working, but resiliency of the rollers in case of disturbances.

To facilitate the tilting of the roller at the drive side the journal bearing of this side may be made spherical or crowned.

The supply of fluids for adjusting the temperature of the rollers or cylinders, such as heating or cooling mediums, for instance hot or cool water, may in my improved arrangement also take place on the attendance side. For this purpose the tubular connections to the interior of the rollers, drums or cylinders are fixed by means of movable or flexible intermediate members. The supply from the distributing pipe 93 may take place through the pin 75 which may be made tubular and from which the heating medium passes in known manner through a chamber in the bearing into the hollow trunnion or journal of the roller. Communication between the pin 75 of the bearing and the distributing pipe 93 may be effected by any suitable movable or extensible connecting member. A simple structure results if as a supplying means between the distributing pipe and the pin a flexible tube 92 of adequate length is employed, which ensures free motion without the necessity of providing glands, stuffing boxes, elastic couplings or flexible metallic hoses.

The arrangement may also be such that the roller can be lifted or raised at both sides, on the side of the drive as well as on the opposite side. The bearing 100 at the drive side is then likewise provided with a pin, 101, which in the above described manner passes through the opening 105 of a washer 104 as well as through the openings 106, 107 of the bar 103. The top rollers then after disengagement from the pipe joints may be lifted off completely, or both ends may be raised and at the same time a tilting motion be carried out around an axis extending along the drive side in the direction of the train of rollers. For this purpose the bottom surface of the bearing 100 is rounded at 102 so that this surface is able to roll to a certain extent upon the washer 104 when the pin swings out.

To render the driving gear resilient jockey rollers or idlers 120, 121 are provided in the example illustrated, Fig. 7, which controlled by springs 123 keep the belt strained in regular service but permit of the upper driving pulleys 44, 45, 46, 47 being raised, the jockey rollers then receding and imparting the correct tension to the belt again as soon as the upper rollers are lowered into their normal positions.

It will be understood that the invention is not limited to the embodiments described and illustrated by way of example and that various structural changes and modifications may be made without departing from the spirit of my invention, and I desire therefore that the appended claims should be construed in the light of prior knowledge.

I claim as my invention:—

1. In combination in a drying apparatus for drying films, strips, skins, webs and the like of cellulose including regenerated cellulose, a train of drying rollers adapted to support the film alternately on one side and on the other side thereof and immediately on the surface of said rollers, a drive for each roller, said train consisting of an upper tier and a lower tier of rollers at least part of said rollers and their drives being adapted to yield under the stress of abnormal forces developing in the operation of the apparatus, second separate drives for said yieldable rollers said second drives likewise being adapted to yield under the stress of abnormal forces, said first and second drives being arranged to compensate slippage of the drives under normal conditions, bearings for said rollers, rigid bases for said bearings, the bearings on at least one side of the rollers of one tier being loosely mounted on their bases to accommodate the spacing apart of the rollers of one tier from the rollers of the other tier, the rollers of the upper tier being provided at their ends remote from said loosely mounted bearings with tiltably mounted bearings to accommodate tilting rollers of the upper tier about an axis arranged substantially in the direction of the roller train,

the bearings on at least one side of the upper tier being provided individually with guiding means for accommodating movement of said bearings in a substantially vertical plane only.

2. The drying apparatus defined in claim 1, characterized in that at least the loosely mounted bearings are provided individually with guiding means comprising a substantially vertically disposed stem connected to the bearing and slidably positioned in a guiding slot in the rigid base for the bearing.

3. The drying apparatus defined in claim 1, characterized in that the guiding means comprises a substantially vertically disposed stem rigidly connected to the loosely mounted bearing and slidably positioned in a guiding slot in the rigid base for the bearing, the longitudinal axis of said slot and of said bearing being in substantially the same vertical plane and said slot having width dimensions accommodating deviations of said stem transverse to said rigid base.

4. The drying apparatus defined in claim 1, characterized in that washers are located between the loosely mounted bearings and their rigid bases, and in that the guiding means comprises a substantially vertically disposed stem connected to the loosely mounted bearing and slidably positioned in a guiding slot in the rigid base for the bearing and likewise in an opening in the washer, said washer opening being of such size with relation to the size of the stem as to accommodate deviation of the latter.

5. The drying apparatus defined in claim 1, characterized in that the guiding means comprises a substantially vertically disposed hollow stem rigidly connected to the bearing and slidably positioned in a guiding slot in the rigid base for the bearing, and further characterized in that the bearing and its roller are hollow and the hollow stem is connected to a fluid supply pipe by means of a movable hollow connection member for movement of fluid into the interior of the roller.

ERNST BLEIBLER.