Aug. 23, 1932. H. P. FELL 1,873,833

CYLINDER DRYING MACHINE

Filed Dec. 19, 1929

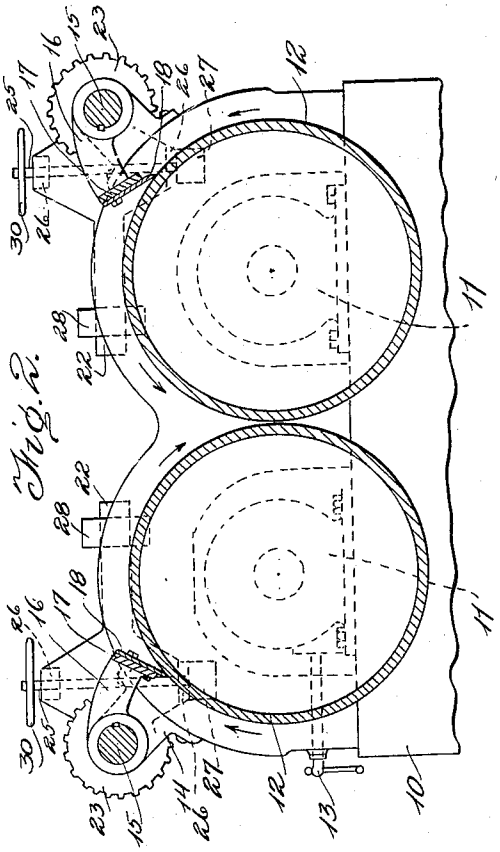


Fig. 2.

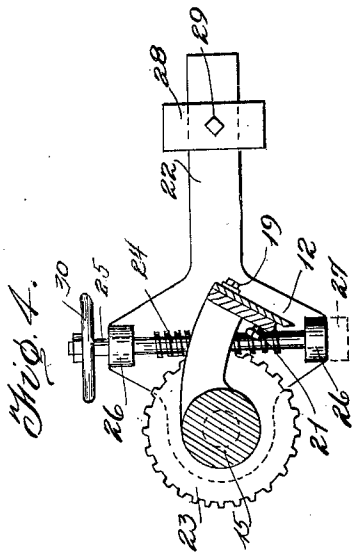


Fig. 4.

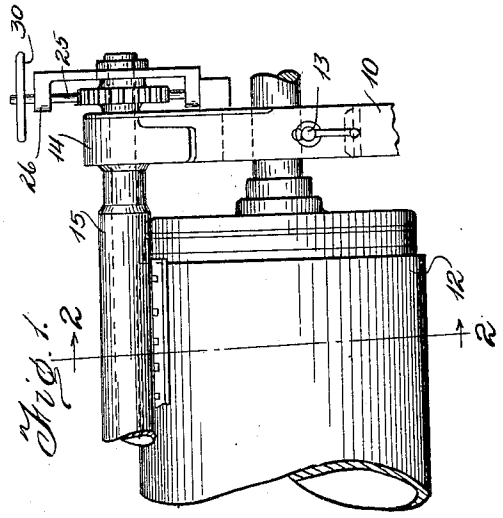


Fig. 1.

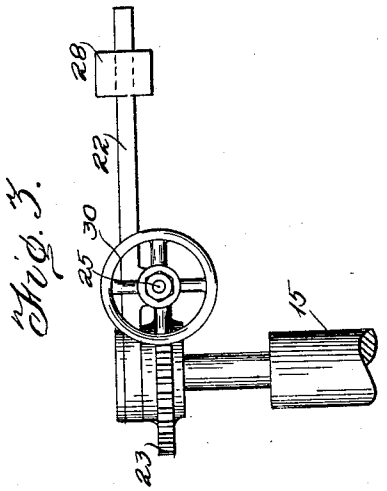


Fig. 3.

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Patented Aug. 23, 1932

1,873,833

UNITED STATES PATENT OFFICE

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CYLINDER DRYING MACHINE

Application filed December 19, 1929. Serial No. 415,316.

This invention relates to evaporating machines of the revolving cylinder type such as dry milk machines, and has special reference to the scraper or, as it is technically known, doctor for such machines.

Machines of this class generally embody one or more revoluble heated cylinders upon which liquid material to be evaporated is deposited, the action of the machine causing the material to form a thin film on the roll or rolls. Because of its thinness this film drys on the roll while the latter makes a partial revolution. The dried film is then scraped from the roll by the doctor which is a knife or blade extending along the roll in contact therewith. This doctor is carried on a bar known as a doctor bar which is adjustable to enable the doctor knife to be brought into close contact with its roll.

In the present constructions of such machines these doctors are imperfectly efficient because: (1) The "doctor" or stripping knife, because of the manner of its mounting, cannot be laid flat on the roll so the operation becomes one of scraping rather than cutting, necessitating a very heavy pressure on the stripping knife itself and, as a result thereof, a considerable amount of power to rotate the roll under the knife. This heavy pressure on the stripping knife causes the knife to wear rapidly necessitating frequent replacements and also causes scoring of the rolls themselves, necessitating regrinding at more or less frequent intervals. (2) The "doctor" bar is so mounted that if the knife catches in any imperfection or scratch in the roll, the knife is forced into the roll breaking the knife and sometimes injuring the roll so badly that replacement is necessary.

Because of these defects one important object of the invention is to provide an improved means for mounting the doctor bar and its knife so that the latter will be substantially tangential or flat on the roll.

A second important object of the invention is to provide an improved arrangement of doctor bar in such a machine so that catching of the knife in a scratch or other imperfection of the roll will cause the knife to swing away from the roll and thus to free itself, thereby preventing further injury to the roll and breaking of the knife.

With the above and other objects in view, as will be presently apparent, the invention consists in general of certain novel details of construction and combinations of parts hereinafter fully described, illustrated in the accompanying drawing and specifically claimed.

In the accompanying drawing like characters of reference indicate like parts in the several views, and:—

Figure 1 is a side elevation of a machine constructed in accordance with this invention.

Figure 2 is a section on the line 2—2 of Figure 1.

Figure 3 is an enlarged plan view of the mechanism for adjusting the doctor bar.

Figure 4 is an elevational view of the part shown in Figure 3.

In the embodiment of the invention here illustrated the frame 10, roll bearings 11, rolls 12 and roll adjustment 13 have been conventionally shown as the specific construction of these parts does not form part of the present invention.

Those parts which do relate specifically to the invention will now be described. On the end frame members 10 are mounted bearings 14 in which is journalled a shaft 15. Arms 16 are fixed in these shafts adjacent the ends of the rolls 12 and doctor bars 17 connect the outer or free ends of the arms, each doctor bar connecting the arms of a respective shaft. Each doctor bar carries a doctor knife 18 which is fitted against the outer face of the respective doctor bar and is then held by bolts 19 and washers 20. While but one such bolt and washer is shown in any of the figures of the present drawing it is obvious that at least two bolts are employed for each knife, one adjacent each end of such knife. These knives are substantially tangent to the rolls 12, the flat face of the knife blade engaging the roll at a very acute angle. Moreover, the edge of each knife engages the surface of the roll on a portion which, due to the direction of revo-

lution of the roll as shown by arrows in Figure 2, is moving away from the axis of the shaft 15. In other words, the knife engages the roll on the retreating portion of the roll with reference to a plane passed through the axes of the roll and the doctor bar shaft 15. This is a very important feature of the invention since any roughness on the roll engaging the knife will cause the latter to swing away from the roll. It may here be mentioned that, in the machines now commonly used the knife engages the roll on the part advancing toward such plane so that, when caught by an imperfection the knife tends to bite into the roll with resultant damage to the knife or roll or to both.

Adjusting screws 21 extend at spaced intervals through the doctor bar and bear on the doctor knife to spring the thin knife from the bar slightly where necessary to insure its contact throughout its length with its roll.

A weight arm 22 is revolubly mounted on each shaft 15 adjacent its end, the latter projecting through the bearing 14 for this purpose. A worm wheel 23 is keyed to the shaft 15 between the weight arm and the bearing 14 and is engaged by a worm 24 formed or mounted on a shaft 25 supported in bearings 26 carried by the weight arm. In order to carry these bearings 26 and provide room for the worm 24 the weight arm is vertically extended opposite said worm and the lower extension normally rests on a lug 27 formed on the frame 10, being there held by an adjustable weight 28 slidably mounted on the weight arm and secured in adjusted position by a set screw 29. A hand wheel 30 is fixed on the upper end of the shaft. By means of the worm and wheel the knife may be adjusted to proper bearing against the roll and there held by the weight 28. However, if an obstruction on the roll engages the edge of the knife the latter will move and lift the weight arm until free from the obstruction, whereupon it will drop back to its normal position. To this end it will be noted that the weight arm 22 projects from the shaft 15 in the same general direction laterally as the doctor bar arms 16.

There has thus been provided a simple and efficient device of the kind described and for the purpose specified.

It is obvious that minor changes may be made in the form and construction of the invention without departing from the material principles thereof. It is not therefore desired to confine the invention to the exact form here shown and described but it is desired to include all forms which properly come within the scope claimed.

Having thus described the invention, what is claimed as new, is:—

1. In a machine of the class described, a revoluble drying roll, a doctor bar shaft adjacent said roll and parallel thereto, a doctor bar supported from said shaft to swing about the axis of the shaft, a doctor knife carried by said bar and engaging said roll substantially tangent thereto and on a portion of the roll receding from a plane extending through the axes of the roll and doctor shaft, a weighted arm journalled on the shaft and holding the knife against the roll, and means to adjust the position of the arm on the shaft angularly relative to the doctor bar.

2. In a machine of the class described, a revoluble drying roll, a doctor bar shaft adjacent said roll and parallel thereto, a doctor bar supported from said shaft to swing about the axis of the shaft, a doctor knife carried by said bar and engaging said roll substantially tangent thereto and on a portion of the roll receding from a plane extending through the axes of the roll and doctor shaft, a weighted arm journalled on the shaft and holding the knife against the roll, means to adjust the position of the arm on the shaft angularly relative to the doctor bar, and a stop engaging said arm to limit the movement of the knife in the direction of the roll.

3. In a machine of the class described, a revoluble drying roll, a doctor bar shaft adjacent said roll and parallel thereto, a doctor bar supported from said shaft to swing about the axis of the shaft, a doctor knife carried by said bar and engaging said roll substantially tangent thereto and on a portion of the roll receding from a plane extending through the axes of the roll and doctor shaft, a weighted arm journalled on the shaft and holding the knife against the roll, a worm wheel fixed on said shaft, a worm meshing with said wheel and journalled on said arm, means to rotate said worm, and a stop engaging said arm to limit movement of the knife in the direction of the roll.

4. In a machine of the class described, a doctor bar shaft journalled for rotation about its axis, spaced arms projecting from said shaft, a doctor bar carried by the free ends of said arms, weight arms journalled on said shaft and projecting in the same general direction as the first arms, weights on said weight arms, and means to adjust the angular relation between the weight arms and the first arms.

5. In a machine of the class described, a doctor bar shaft journalled for rotation about its axis, spaced arms projecting from said shaft, a doctor bar carried by the free ends of said arms, weight arms journalled on said shaft and projecting in the same general direction as the first arms, weights on said weight arms, bearings on each of said weight arms alined transversely thereof, a worm journalled in the bearings of each weight arm, and worm wheels fixed on said shaft and meshing respectively with said worms.

6. In a machine of the class described, a

doctor bar shaft journalled for rotation about its axis, a drying drum adjacent the shaft spaced arms projecting from said shaft, a doctor bar carried by the free ends of said arms, weight arms journalled on said shaft and projecting in the same general direction as the first arms, means to limit movement in one direction of said weight arms weights on said weight arms, means to adjust the angular relation between the weight arms and the first arms, and a knife secured to the doctor bar on the face remote from the doctor bar shaft and adapted to lie against said drum.

7. In a machine of the class described, a doctor bar shaft journalled for rotation about its axis, a drying drum adjacent the shaft spaced arms projecting from said shaft, a doctor bar carried by the free ends of said arms, weight arms journalled on said shaft and projecting in the same general direction as the first arms, means to limit movement in one direction of said weight arms weights on said weight arms, bearings on each of said weight arms alined transversely thereof, a worm journalled in the bearings of each weight arm, worm wheels fixed on said shaft and meshing respectively with said worms, and a knife secured to the doctor bar on the face remote from the doctor bar shaft and adapted to lie against said drum.

In testimony whereof I affix my signature.

HUGH P. FELL.