Nov. 9, 1937. J. SCHMITZ, JR 2,098,890

DYEING MACHINE

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Fig. 2.

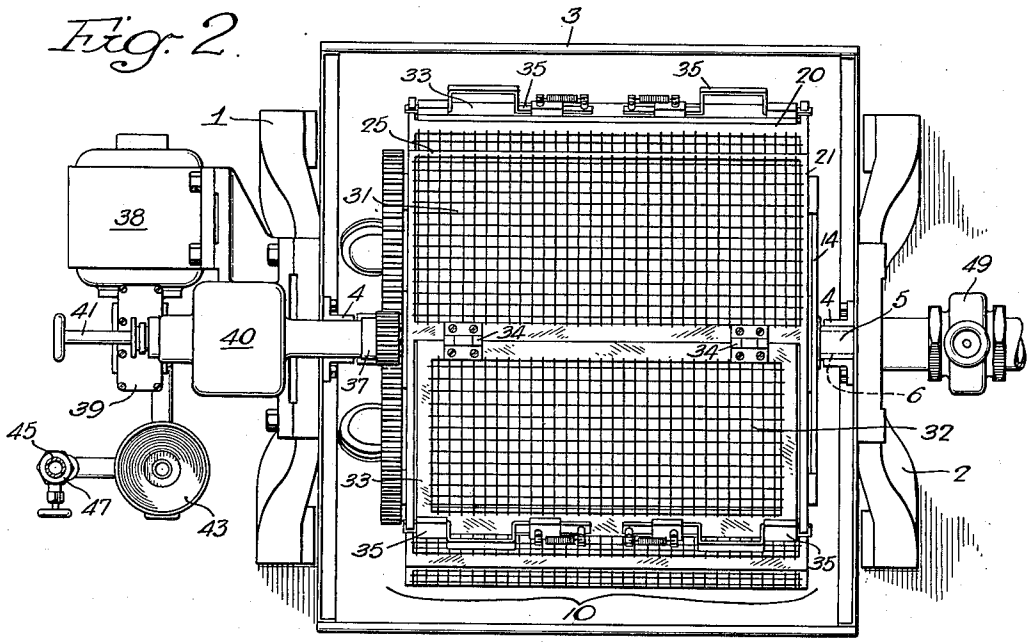
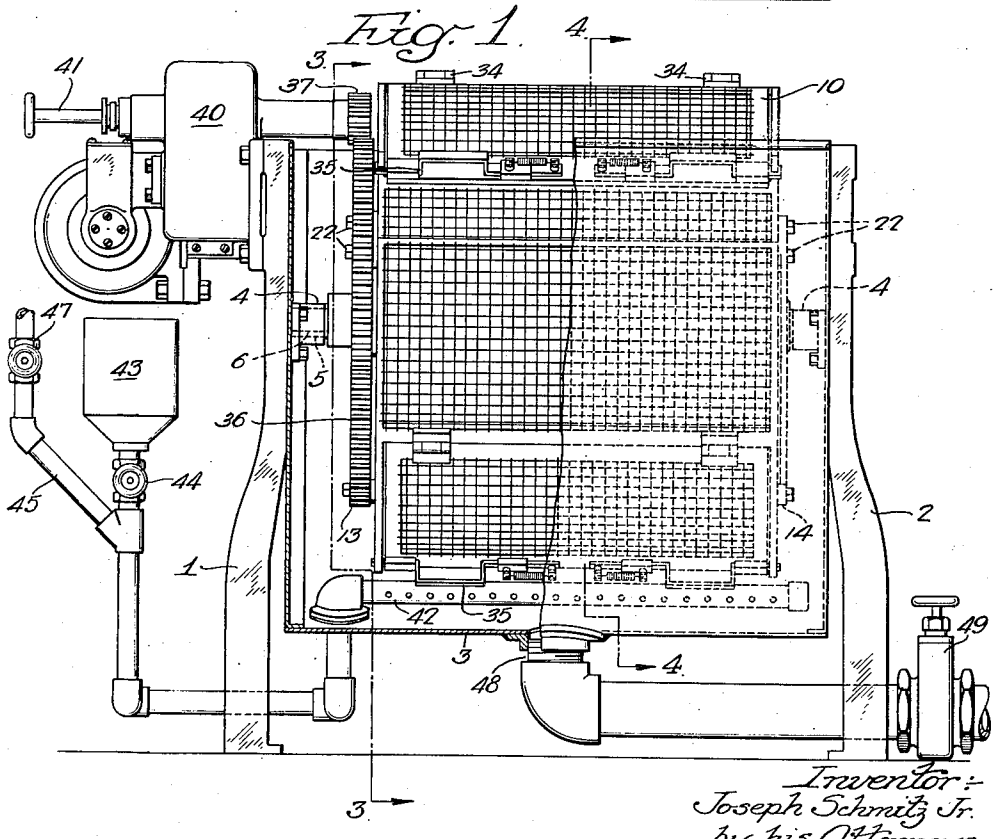


Fig. 1.



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Fig. 3.

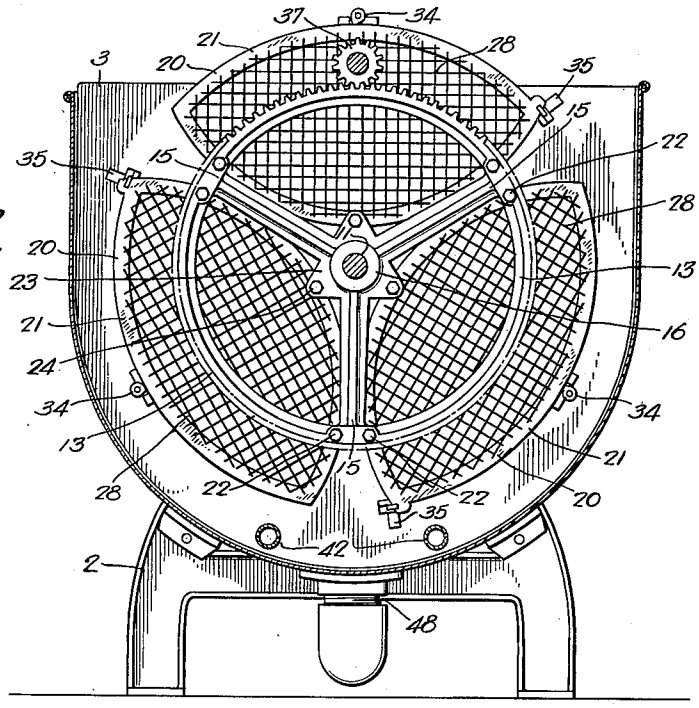
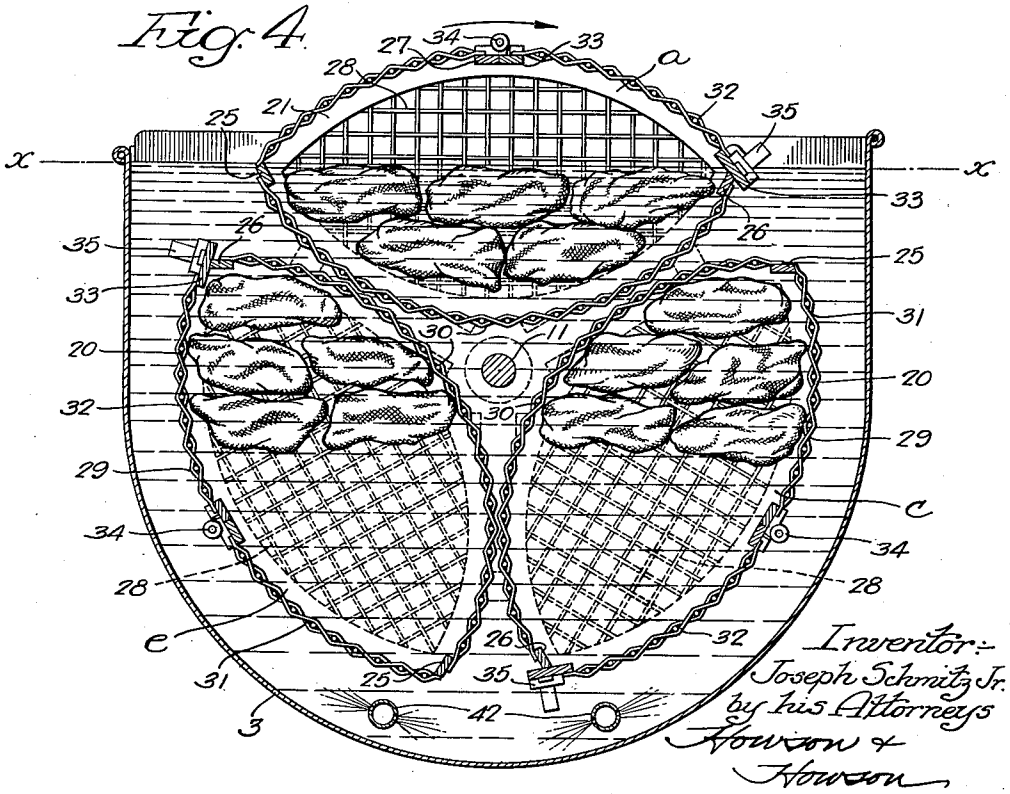


Fig. 4.



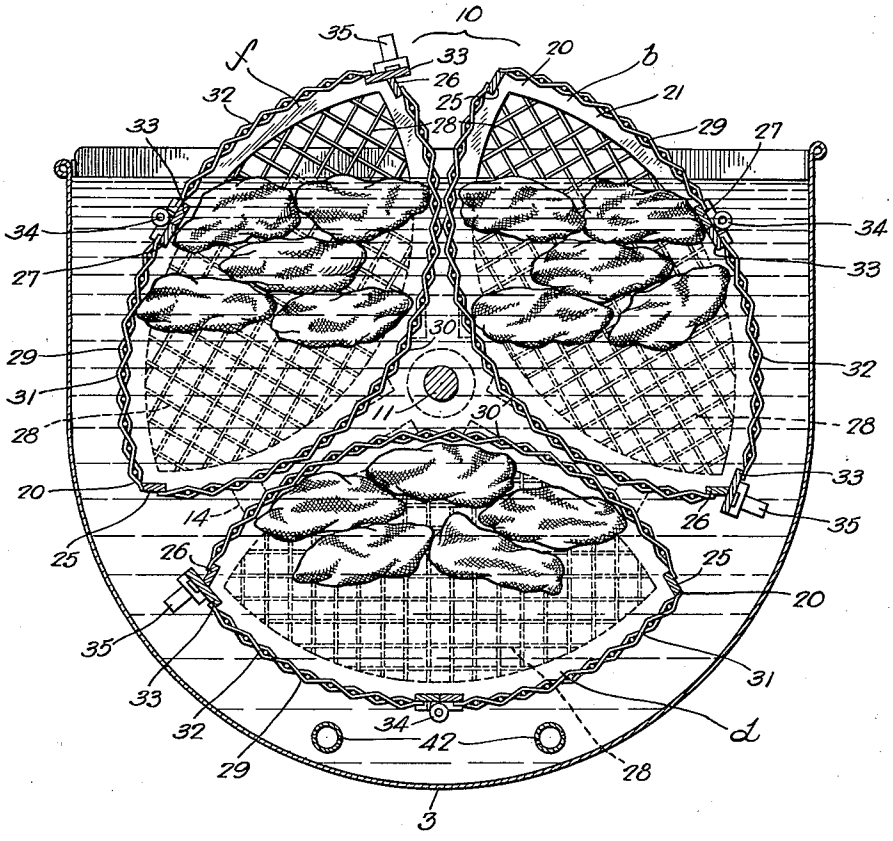
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Fig. 5.



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UNITED STATES PATENT OFFICE

2,098,890

DYEING MACHINE

Joseph Schmitz, Jr., Philadelphia, Pa.

Application February 17, 1934, Serial No. 711,771

2 Claims. (Cl. 8—19)

This invention relates to dyeing machines and particularly to those of the rotary type commonly employed for the dyeing of hosiery, wherein a batch of stockings is placed in a porous woven or mesh bag and a plurality of such bags are placed in each of a plurality of compartments formed by and between radially extending partitions in the barrel or drum of the dyeing machine.

In dyeing machines of this general type the dye liquor is usually maintained at a level below the axis of rotation of the drum and as the drum is rotated the bags of hosiery in the compartments are successively picked up and out of the liquor, carried over the axis of the drum and resubmerged in the liquor at the opposite side of the center of the drum as the drum rotates.

During the dyeing of the stockings in this manner the bags of hosiery are subjected to considerable tumbling in the compartments, which tangles the hosiery to a great extent and causes what is known in the art as roughing or friction marks on the hosiery. This condition is prevalent particularly in the dyeing of natural or artificial silk hosiery which is reinforced with cotton in the heel, toe and foot sole portions thereof and in which such marks develop.

As a result of this method of dyeing hosiery, when the dyer wishes to take a sample from one of the bags it is necessary to stop the drum with one of the compartments thereof turned upwardly, which holds the stockings in that particular compartment clear of the dye liquor while the stockings in the remaining compartments are held submerged in the liquor.

As a result of the tumbling, which the stockings have received during dyeing, the stockings are tangled to such an extent that it takes the dyer a considerable length of time to extract a sample stocking from the batch. During this time and while the sample is being compared with a color chart or a previously dyed sample which is to be matched all the stockings in the elevated compartment are subjected to contact with the atmosphere. Such exposure causes oxidation of the dye stuff and changes the shade of the exposed batches of stockings from that of the submerged batches, thus the entire lot is not uniform throughout when removed from the dyeing machine.

One object of the invention is to provide a method of dyeing wherein the stockings are not subjected to tumbling nor exposed to the atmosphere at any time during dyeing or sample taking.

Another object of the invention is to construct the drum of the dyeing machine in such a manner that the batches of hosiery or a bulk of any kind of material to be or capable of being dyed in this type of machine is primarily suspended and floated freely in and submerged completely adjacent the surface of the dye liquor and, as the drum is rotated, the bulk of material is floated laterally, first in one direction, then downwardly, then laterally in the opposite direction and upwardly to the first position, without effecting rotation of the bulk about its own axis in the compartment in which it is confined.

Another object of the invention is to shape the compartments in such a manner that, as the drum rotates, the walls of each compartment will effect a lengthwise non-compressive contraction and crosswise expansion of the bulk within the compartment during passage of the compartment through certain sectors of the cycle of rotation of the compartment about the axis of the drum; and during the passage of the compartment through other sectors the walls of the compartment will effect or permit free inherent lengthwise expansion and crosswise contraction of the bulk in the compartment.

Another object of the present invention is to so construct the dyeing machine vat and the journals for the drum in such a manner that the level of the dye liquor may be maintained well above the axis of rotation of the drum at all times, whereby the entire lot of stockings in the drum will be submerged in the dye liquor constantly and at no time subjected to contact with the atmosphere even while samples are being taken.

The construction and operation of the mechanism forming the subject of the present invention will be fully disclosed hereinafter, reference being had to the accompanying drawings; of which:

Fig. 1 is a front elevation of the dyeing machine with a portion of the vat broken away;

Fig. 2 is a plan view;

Fig. 3 is a transverse sectional elevation taken on the line 3—3, Fig. 1;

Fig. 4 is a transverse sectional elevation taken on the line 4—4, Fig. 1 and drawn to an enlarged scale;

Fig. 5 is a view similar to Fig. 4 showing the drum in a different position in a cycle of rotation thereof.

As shown in Figs. 1 and 2, the machine comprises, in general, end frames 1 and 2 which support a substantially semi-cylindrical or U-shaped vat 3. Within the vat 3 and well below the top edge thereof and secured to the end frames 1 and 2 respectively are sockets 4, 4 which receive

and support bearing boxes 5, 5, for trunnions 6, 6, which project laterally from the opposite ends respectively of the drum 10 of the machine and rotatably support said drum in said vat.

In the present instance the trunnions 6, 6 constitute the opposite ends of a shaft 11 which extends axially and completely through the drum 10 with its opposite ends 6, 6 projecting from the ends of the drum as above noted.

The drum comprises a pair of rings 13 and 14 respectively which are disposed concentrically with respect to the shaft 11 and are supported by radially extending arms 15 formed integral with the rings and with hubs 16 which are secured to the shaft 11 in spaced relation to each other longitudinally thereof.

In the present instance, the drum 10 consists of three independent baskets 20, each of a general elliptical shape in cross section, as clearly shown in Figs. 3, 4 and 5. Each basket 20 comprises open end frames 21, 21 which are secured to the rings 13 and 14 respectively by bolts 22. Adjacent the shaft 11 each of the end frames 21 is secured by a bolt 24 to a radially extending lug 23 formed on the hub 16.

The end frames 21, 21, in each instance, are maintained in laterally spaced relation to each other, in a direction longitudinally of the shaft 11, by longitudinally extending bars 25, 26 and 27.

The opposite ends of each of the elliptical baskets 20 are covered with wide open mesh metal screening 28, which is secured to the frame 21 in any suitable manner, as, for example, by welding or brazing the cut ends of the screen wires to said frame.

The inner semi-elliptical wall 30 of each of the baskets 20 is composed of similar wide open wire mesh screening and is formed on a continuous uninterrupted arc of a circle struck from a center disposed beyond the periphery of the drum, in the present case. The inner walls 30 of the three baskets, in the present instance, are disposed in relatively close substantially tangential relation to each other around the shaft 11.

The outer wall 29 of each of the baskets or compartments 20 is formed on an arc struck from the axis of the shaft 11, in the present instance, and is divided into two parts 31 and 32 respectively. The part 32 constitutes a door for the compartment and is composed of a substantially rectangular convexed frame 33 which is hinged at 34 to the longitudinal bar 27 of the basket compartment 20, said door frame being covered with wide wire mesh the same as or similar to that of the end and inner walls of the basket.

The section 31 of the outer wall 29 is likewise composed of wide open mesh with the edges thereof secured to the longitudinal bars 25 and 27 and to the end frames 21, 21 of the basket. Any suitable form of latch 35 may be provided on the frame 33 for securing the free edge of the door section 32 to the longitudinal bar 26 of the basket.

Formed on or secured to the drum ring 13 is a gear 36 which meshes with a pinion 37 fixed to a horizontal shaft disposed above the upper edge of the vat 3 and driven from a motor 38 through a speed reduction device 39 and variable speed mechanism enclosed within a casing 40, the speed variations of the pinion 37 being controlled by a suitable plunger 41 projecting from one side of the casing 40.

Included in the driving mechanism is or may be a suitable revolution counter and reversing mechanism whereby, after the drum 10 makes a predetermined number of revolutions in one direction the direction of rotation is changed and the drum then makes a predetermined number of revolutions in the opposite direction. This mechanism, however, forms no part of the present invention and is therefore not described in detail.

Dye liquor is adapted to be run into the vat 3 through suitable pipes 42, 42 mounted in the bottom of the vat 3, below the drum 10, said pipes 42 being supplied with said liquor from a container 43 under control of the valve 44 and accelerated by steam pressure supplied through a pipe 45 under control of a valve 47. Exhaust of the dye liquor from the vat 3 is effected through a drain pipe 48 under control of a valve 49. Clear rinsing water may be supplied to the vat in any suitable and convenient manner.

As shown in Fig. 4, the level of the dye liquor x, x is maintained well above the axis of the drum shaft 11. One of the baskets 20 is shown with the longer axis of its elliptical cross section disposed substantially horizontal in the position in which the basket may be opened, to load or unload the basket or to take samples from one of the several bags containing batches of hosiery confined within the basket. The other two of the baskets, which with the first said basket constitute the drum 10, are shown with their longer axes disposed at angles of substantially 120° with respect to the corresponding axis of the uppermost basket.

In Fig. 5, the drum is shown as having rotated through an angle of substantially 60°, from the position shown in Fig. 4, wherein one of the baskets is shown with its longer axis disposed in a horizontal plane below the shaft 11 and the other two baskets with their long axes disposed at 120° angles from the axis of the lowermost basket.

In the course of operation of the device, after each of the baskets has been loaded with a predetermined number of bags or batches of stockings, the drum 10 rotates from the positions shown in Fig. 4, through the position shown in Fig. 5 for a predetermined number of complete revolutions, in one direction, and then through a predetermined number of complete revolutions in the opposite direction. In the course of such revolutions of the drum all the bags are maintained continually below the liquor level x, x as clearly shown in Figs. 4 and 5.

The character of the goods being dyed, i. e. hosiery, is such that the bags of stockings tend to float and rise in the liquor and as the drum rotates, see for example, in the direction of the arrow in Fig. 4, the bags in the uppermost basket are floated laterally by gentle contact with the inner arcuate wall 30 of the uppermost basket.

As the baskets move from position a (Fig. 4) to position b (Fig. 5) the lateral movement of the bags in the upper basket is restricted by and between the arcuate walls 29 and 30, and by which the bags are removed closer together, contracting the mass composed of the several bags in the basket lengthwise, as viewed in Figs. 4 and 5, while the mass continues to be suspended in the dye liquor, as clearly shown at position b in Fig. 5.

As the basket moves from position b (Fig. 5) to position c (Fig. 4) the inner arcuate wall 30 and the outer arcuate wall 29 of the basket move around the floating bags without materially disturbing the general relation of the bags one to

another and without effecting any tumbling of the bags.

The basket then moves from position *c* (Fig. 4) to position *d* (Fig. 5) wherein the mass or plurality of bags again spreads or expands lengthwise, contracts crosswise, and floats upwardly toward the inner arcuate wall **30** of the basket then in the lowermost position, as clearly shown in Fig. 5.

Continued rotation of the drum moves the basket from position *d* (Fig. 5) to position *e* (Fig. 4), wherein the basket again revolves about the bags of stockings which tend to float upwardly in the liquor, but, due to the restriction of the inner wall **30** and outer wall **29** of the basket the mass or plurality of bags of stockings is again contracted lengthwise and expanded crosswise as the bags are moved into a closer relationship to each other, still without effecting any tumbling of the bags.

From position *e* (Fig. 4) to position *f* (Fig. 5) the basket continues to revolve about the upwardly floating bags of stockings which, during such movement of the basket, spread lengthwise and contract crosswise again until the maximum original uppermost position is reached, as the basket moves from position *f* (Fig. 5) to position *a* (Fig. 4), for a repeat of the cycle.

Due to the open elliptical character of the baskets and the high level and substantially quiescent state of the liquor in the vat the baskets, as above noted, in effect, revolve about their respective contents and in so doing, and by reason of their shape, effect the above noted gentle contractions and expansions of their respective contents without actually compressing the mass, which creates just the right amount of gentle agitation of the dye liquor through the contents of the baskets to secure complete penetration by the dye liquor into the very innermost parts of the contents, such as the back-leg and foot seams of full fashioned hoisery; and as a result of the rotation of the baskets about their respective contents no tumbling and consequent tangling of the contents, and therefore no friction marking of the stockings, is effected.

The open character of the baskets, provided by the wide open mesh screen presents no resistance to the free flow of the liquor and this causes no violent agitation of the liquor as the drum rotates.

After the mass has been so treated for a predetermined period of time, a sample may be readily withdrawn from any one of the bags in any one of the baskets and rinsed to prevent oxidation while the rest of the lot remains below the liquor level and consequently is not subjected to oxidation.

If the lot has been dyed to the required degree the dye liquor may be drawn off through the pipe **43** and clear rinse water run into the vat so that the color is set without exposing the mass to shade variations by oxidation.

I claim:

1. In a rotary dyeing machine, a drum comprising a plurality of substantially elliptical containers for respectively receiving material to be dyed, said containers being arranged in fixed relation to each other and to and about the axis of the drum with the shorter dimensions of their elliptical cross sections disposed respectively in planes radiating from the axis of the drum in substantially equiangular spaced relation to each other, and the outer semi-elliptical walls of said containers disposed in circular planes forming segments of a circle having its center coincident with the axis of the drum, and the inner semi-elliptical walls of the containers disposed in single continuous circular planes in arcs struck from centers outside the periphery of the drum with said inner walls substantially tangentially arranged one to the other adjacent the axis of the drum.

2. In a rotary dyeing machine, a drum comprising a plurality of substantially elliptical containers for respectively receiving material to be dyed, said containers being arranged in fixed relation to each other and to and about the axis of the drum with the shorter dimensions of their elliptical cross sections disposed respectively in planes radiating from the axis of the drum in substantially equiangular spaced relation to each other, and the inner semi-elliptical walls of the containers disposed in single continuous circular planes in arcs struck from centers outside the periphery of the drum with said inner walls substantially tangentially arranged one to the other adjacent the axis of the drum.

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