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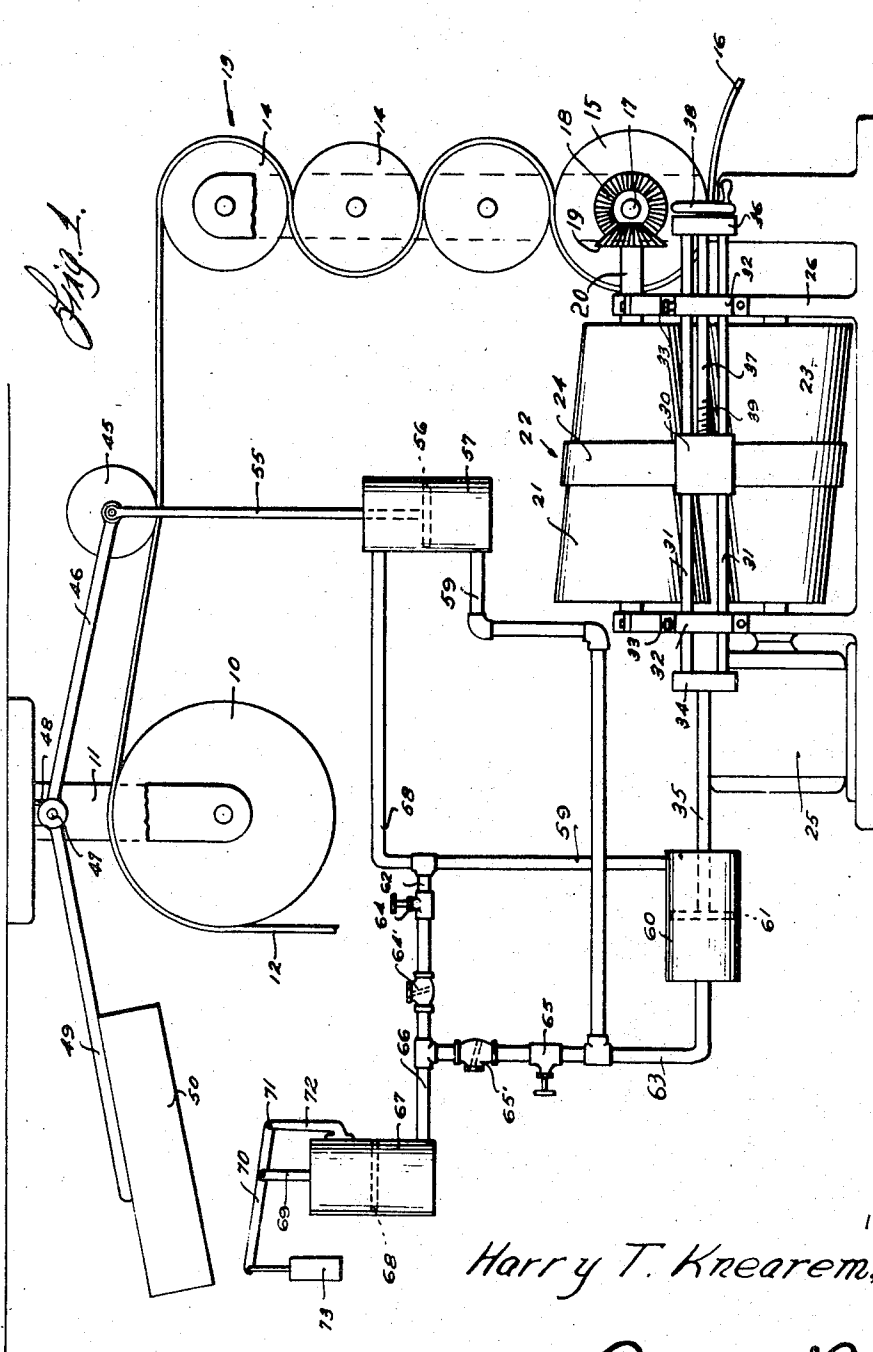
H. T. KNEAREM

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PAPER MAKING APPARATUS

Filed Nov. 18, 1944

3 Sheets-Sheet 1



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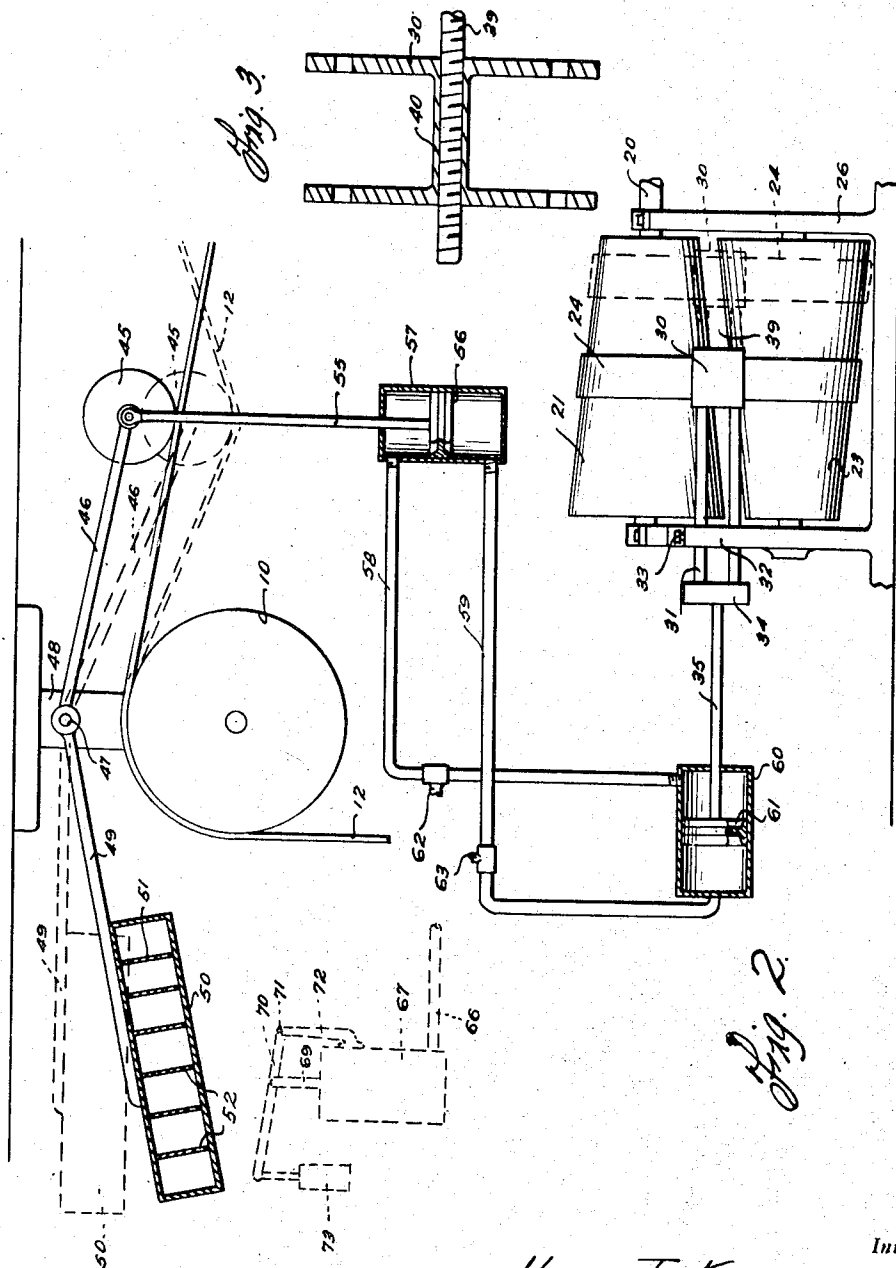
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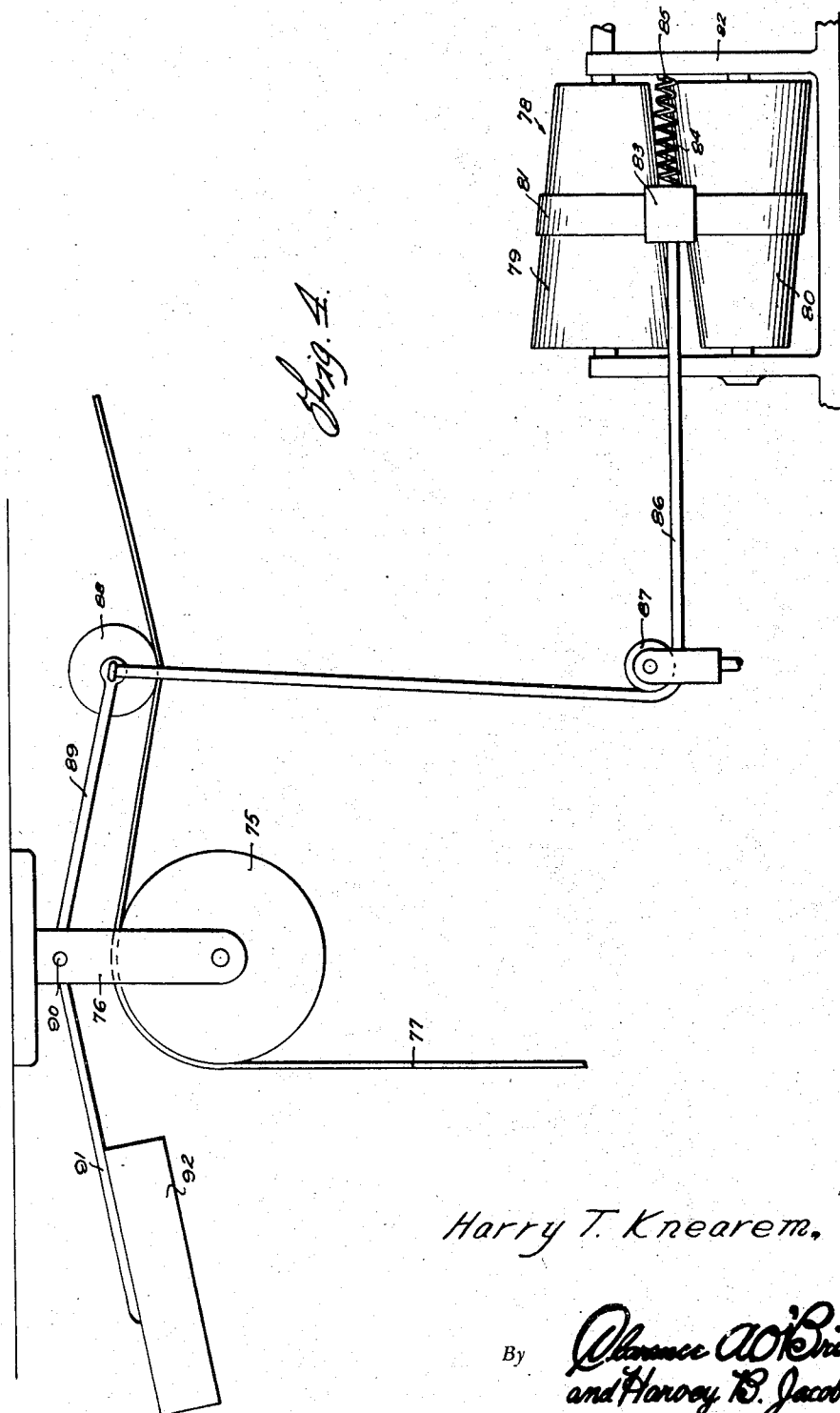
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PAPERMAKING APPARATUS

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This invention relates to an automatic speed control, and more particularly to such a control adapted for use in connection with the calender rolls in a paper manufacturing plant, or the like.

The primary object of this invention is the provision of a speed control adapted to adjust the speed of such calender rolls in accordance with the tension of the paper being fed thereto, to maintain the tension substantially constant and thus avoid the cutting, marring, wrinkling, or the like, of the paper by the calender rolls.

A further object of the invention is the provision of such a mechanism adapted to vary the speed of the calender rolls through the position of a belt connection of a two-part cone clutch, the position of the belt being governed by the tension of the paper as fed to the calender rolls.

A still further object of the invention is the provision of such a device which may be automatically operated in accordance with the position of a roll between the drier and the calender stacks.

A more specific object is the provision of such automatic means for controlling the position of the belt between the pulleys of the cone clutch in association with a manual means for controlling such position, means being provided whereby the automatic control may be readily and simply shifted to manual, or vice versa.

A still further object is the provision, in association with the roll between the drier and the calender stacks of a tank containing fluid adapted to serve as a counterbalance for the roll in such manner as to control the tension required to lift the same, whereby the automatic speed control is operated.

An additional specific object of the invention is the provision of means in such a fluid-filled tank adapted to preclude the sudden shifting of the fluid in such manner as to cause vibration in the roll, such as might be occasioned by minor jerks or vibrations in the driving mechanism.

Other objects reside in the combinations of elements, arrangements of parts, and features of construction, all as will be more fully pointed out hereinafter and disclosed in the accompanying drawings, wherein there are shown two preferred embodiments of this inventive concept.

In the drawings:

Figure 1 is a diagrammatic side elevational view, certain parts thereof being indicated by dotted lines, of one form of apparatus embodying the instant inventive concept.

Figure 2 is a view similar to Figure 1 but showing certain related parts thereof in section, certain of the parts being omitted.

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Figure 3 is a fragmentary sectional view of a constructional detail, and

Figure 4 is a diagrammatic side elevational view of a modified form of construction.

Like reference numerals refer to like parts throughout the several views of the drawings.

Having reference now to the drawings, and more particularly to Figure 1, there is generally indicated at 10 a drying roll rotatably supported by any suitable type of supporting brackets 11, over which a strip or sheet of paper 12, to be dried and calendered, passes to a calender stack generally indicated at 13. The calender stack is comprised of a plurality of rotatable rolls 14, mounted in vertical alignment on supports 15 of any suitable type, the paper 12 being adapted to pass on opposite sides of successive rolls and eventually to exit from the lowermost roll, as at 16, from which it may be passed to any desired source, such as another stack of calender rolls, or the like.

The lowermost of the calender rolls 15 is provided with an axle 17 on which is mounted a bevel gear 18 adapted to coact with a bevel gear 19, mounted on the extending shaft 20 of one pulley 21 of a cone clutch generally indicated at 22. The other pulley 23 of the clutch, connected to the pulley 21 as by a belt 24, is adapted to be driven in any suitable manner, as by a suitable motor 25. The pulleys 21, 23 are shown in exaggerated form for the purposes of illustration, and are mounted on any suitable supporting frame 26.

From the foregoing, it will be readily apparent that the speed of rotation of the calender rolls is governed by the position of the belt 24 with relation to the pulleys 21 and 23. A belt shifter 30, comprised of a bracket having flanges overlying the sides of the belt 24, is mounted for slidable movement on a pair of rods 31 secured to the frame member 26, and extending slidably through suitable apertures in extensions 32 comprising a portion thereof. Set screws 33 are provided to hold the rods against movement, for a purpose to be more fully described hereinafter. The extremities of the rods 31 terminate at one end in a block 34 secured to a piston rod 35. Thus it will be seen that when the piston rod 35 is moved in a manner to be described more fully hereinafter, and the set screws 33 are released to permit slidable movement of the rods, the belt shifter 30 may be moved thereby to effect movement of the belt 24, and consequently govern the speed of the calender rolls.

The opposite ends of the rods 31 also terminate in a block 36, through a suitable smooth bore in

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which extends a rod 37, the outer extremity of which is provided with a hand wheel 38 and the inner extremity of which is threaded, as at 39.

As best shown in Figure 3, the threaded end 39 of the rod 37 engages a suitable threaded bore 40 extending between the depending tongues of the belt shifter 30.

Thus it will be seen that when the set screws 33 are loosened in the manner previously described, the entire assembly, including the rod 37 and the hand wheel 38, may be readily moved by the piston rod 35, but that conversely when the set screws 33 are tightened, the rod 35 and its associated rods 31 are held immovable, and the belt may be shifted by rotation of the hand wheel 38, such rotation through the threaded end 39 and the threaded bore 40 effecting a transverse sliding movement of the member 30 along the rods 31.

Referring now to the automatic control feature of the device, a roll 45 is rotatably mounted on arms 46, at a position above the section of sheet of paper 12 extending between the drier roll 10 and the calender stack 13. The arms 46 are pivotally secured, as by pivots 47, to a suitable bracket 48, and a counterbalance arm 49 extends from the opposite extremity of the rod 46 and terminates in a counterbalance tank 50. As best shown in Figure 2, counterbalance tank 50 is comprised of a receptacle provided with a plurality of interiorly positioned partitions 51, each of which is provided with a small aperture 52 adjacent the base thereof, the purpose and function of which will be more fully described hereinafter.

Depending downwardly from the axle of roller 45 is a piston rod 55 adapted to operate a piston 56 contained in a cylinder 57. From the upper and lower portions of cylinder 57 tubes or pipes 58 and 59, respectively, lead to the opposite ends of a second cylinder 60, within which is positioned a piston 61 operatively connected to the piston rod 35.

The pipes 58 and 59 are provided with takeoffs 62 and 63, respectively, provided with manually operable valves 64 and 65 and check valves 64' and 65', respectively, both of which communicate with a pipe 66, positioned in the bottom of a fluid pressure tank 67. The tank 67 may be open at its top and has contained therein a piston 68, from which extends a piston rod 69, to which is pivotally secured an arm 70, one extremity of which is pivoted, as at 71, to an upstanding projection 72 secured to the side wall of the reservoir, and the other end of which has suspended therefrom a counter-weight 73.

From the foregoing, the operation of the device should now be readily understandable. The cylinders 57 and 60 are normally maintained filled with fluid, from the tank 67, the fluid pressure being maintained automatically by the counter-weight 73 when the valves 64 and 65 are opened. With the parts in the position shown in Figure 1, the belt 24 is substantially centrally positioned on the cone clutch. However, when the calender rolls are moving too slowly and a slack or tension in the paper occurs, as indicated in dotted lines in Figure 2, a sag is effected in the paper, whereupon the roll 45 drops downwardly and forces the piston 56 downwardly within the cylinder 57. This occasions a forcing of fluid through the pipe 59, into the cylinder 60, which in turn moves the piston 61 and the piston rod 35 to shift the block 34, the rod 31, the belt shifter 30, and hence the belt 24, in a direction toward the larger diameter of the drive pulley 23 and the smaller diameter

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of the driven pulley 21 in such manner as to increase the speed of the calender rolls 14. Obviously, as the tension of the paper is increased to a desired point, and the roll 45 is raised, the piston 56 is raised, passing fluid back through the line 58 to the cylinder 60 in such manner as to force the piston 61 outwardly with respect to the cone clutch and correspondingly move the belt 24 in a direction to retard the speed of the rolls. Once a desired tension in the paper has been achieved, the movement necessary to correctly adjust the same is so slight as to provide a substantially automatic continuous speed control for the calender rolls, maintaining a desired tension in the paper at all times.

The counterbalance tank 50 is provided in such manner that the weight of the roll 45, or the effective pressure thereof against the sheet 12, is maintained substantially constant. Obviously, a greater force is required to lift the roll from a higher position than from a lower position with respect to the drier roll and calender stack. This force is offset by the counterbalance 50, since, when the roll is in its higher position, the pivotal relation of the counterbalance with relation thereto is such that a greater force is exerted thereby, due to the inclination thereof and the relative positioning of the fluid contained therein, than when the roll is in its lower position. Thus the variation of the positioning of the fluid in the counterbalance 50 serves to vary the effective weight thereof. The partitions 51 permit, by means of the apertures 52, a ready flow of fluid from one end of the device to the other as the angle of inclination is shifted, but preclude jerks and jars being imparted to the roll 45 thereby, due to minor vibrations of the mechanism, such as the mounting bracket 48 occasioned by the operating machinery of the plant.

In Figure 4, a modified form of structure is disclosed, including a drier roll 75 mounted on suitable supports 76 adapted to guide a strip of paper 77 to a suitable calender stack (not shown) similar to the calender stack 13. The calender stack is driven by a cone clutch 78 including pulleys 79 and 80 provided with a connecting belt 81 substantially identical to the pulleys 21 and 23 and the belt 24. The pulleys are supported in a suitable mounting bracket 82. The belt shifting device shown in this modification is comprised of a flange member 83, to one side of which is connected a tension spring 84, the other end of which, 85, is suitably secured to one of the frame members 82. Secured to the other side of the belt shifter 83 is a flexible member 86, such as a cord or rope, adapted to pass over a pulley 87 mounted in any suitable fashion, and extends upwardly to the axle of a roll 88 adapted to ride on the portion of the paper sheet 77 between the drier roll and the calender rolls. The roll 88 is mounted on extending arms 89 pivoted, as at 90, to any suitable securing bracket, and provided with an oppositely extending arm 91, on which is mounted a counter-weight 92 substantially identical to the counter-weight 50.

The operation of this form of the device should be readily understandable. As the tension of the paper 77 is decreased, the spring 84 serves to draw the belt shifter 83 in a direction to move the belt in a manner to increase the speed of the rollers, whereupon, when the tension is increased sufficiently to raise the roll 88, the cord or rope 86 biases the belt shifter 83 in the opposite direction against the tension of the spring.

Now, from the foregoing, it will be seen that

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there is herein provided a construction accomplishing all of the objects of this invention and others, including many advantages of great practical utility and commercial importance.

As many embodiments may be made of this inventive concept, and as many modifications may be made in the embodiment hereinbefore shown and described, it is to be understood that all matter herein is to be interpreted merely as illustrative and not in a limiting sense.

I claim:

1. In apparatus for manufacturing paper, the combination of a paper drying roll, paper calender rolls, means for driving said calender rolls, automatic means controllable by the tension of a sheet of paper passing from the drying roll to the calender rolls, the means including a third roll supported by said sheet, operating mechanism governed by the position of said third roll and a counterbalance for said third roll, said counterbalance including a pivotally mounted, fluid-filled tank having a plurality of spaced, substantially vertical partitions therein, each of said partitions being provided with an aperture in the lower portion thereof, whereby relatively slow flow of liquid from one end of the tank to the other in accordance with the position thereof is permitted, said partitions precluding sudden surges of fluid when the tank is jarred by the operating mechanism.

2. In a paper manufacturing apparatus, in combination, a paper drying roll, paper calender rolls, driving means for said calender rolls, automatic means controllable by the tension of a sheet of paper passing from the drying roll to the calender rolls, said automatic means including a third roll engaging and movable by said sheet, operating mechanism governed by the position of said third roll and a counterbalance for said third roll, said counterbalance being pivoted intermediate its ends and having one end secured to said third roll and the other end supporting a fluid containing tank, a plurality of compartments in said tank and communicating means

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for effecting a slow flow of liquid from one end of said tank to the other to vary its center of gravity but preventing sudden surges of fluid therein.

3. In a paper manufacturing apparatus, in combination, a paper drying roll, paper calender rolls, driving means for said calender rolls, automatic means controllable by the tension of a sheet of paper passing from the drying roll to the calender rolls, said automatic means including a third roll engaging and movable by said sheet, operating mechanism governed by the position of said third roll and a counterbalance for said third roll, said counterbalance being pivoted intermediate its ends and having one end secured to said third roll and the other end supporting a fluid containing tank, a plurality of compartments in said tank and communicating means for effecting a slow flow of liquid from one end of said tank to the other to vary its center of gravity but preventing sudden surges of fluid therein, said tank extending longitudinally of said counterbalance, said communicating means effecting shifting of the center of gravity longitudinally of said counterbalance.

HARRY T. KNEAREM.

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