May 16, 1939. L. P. DORSETT 2,158,654

INTERVAL TIMER

Filed Dec. 3, 1935 2 Sheets-Sheet 1

Fig. 1.

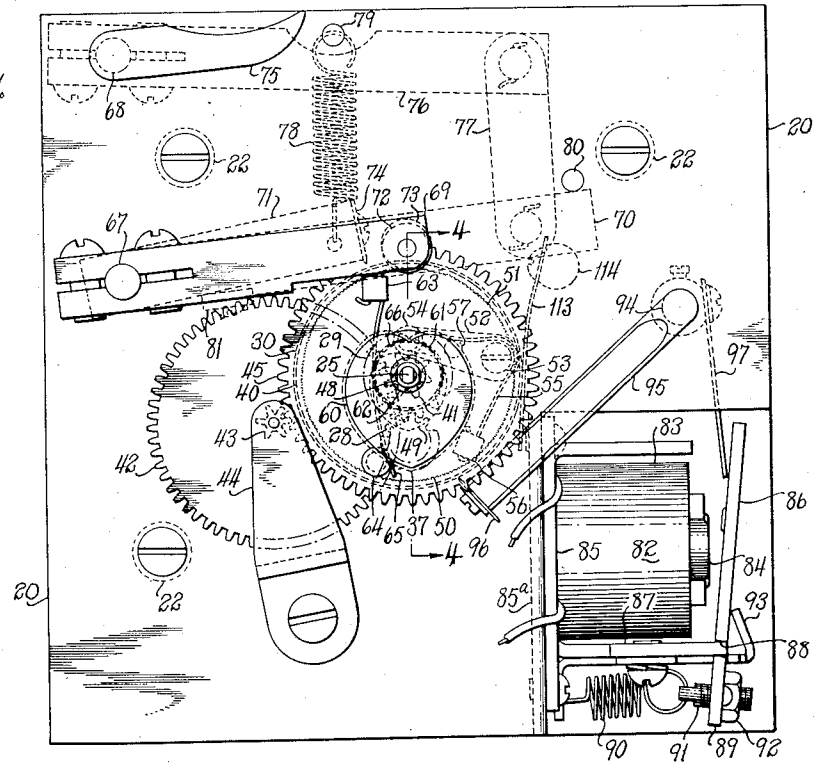


Fig. 2.

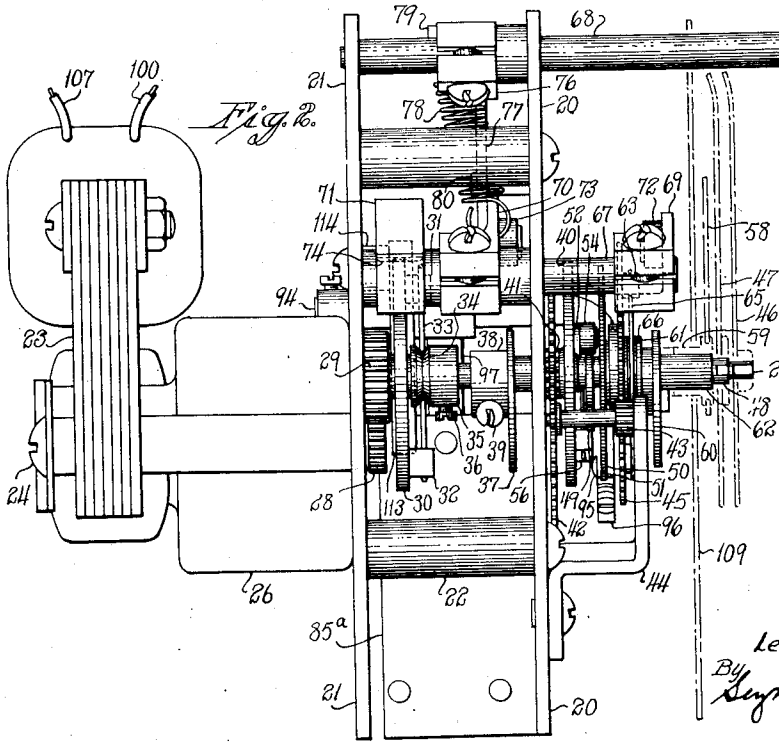
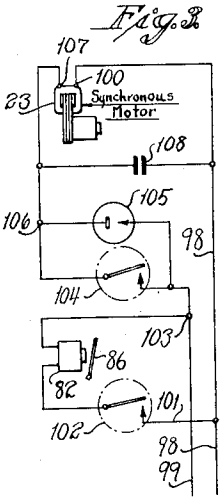


Fig. 3.



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Fig. 4.

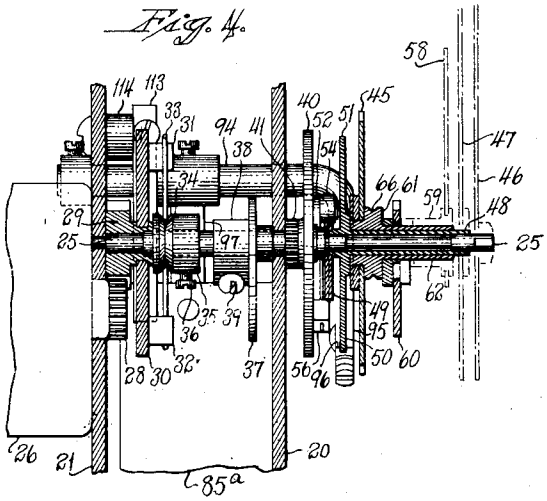


Fig. 5.

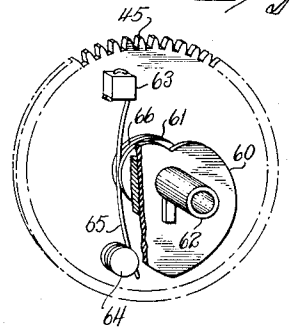


Fig. 6.

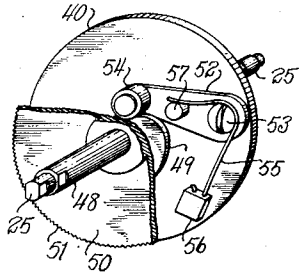


Fig. 9.

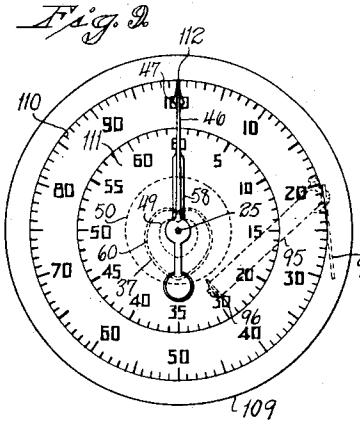


Fig. 10.

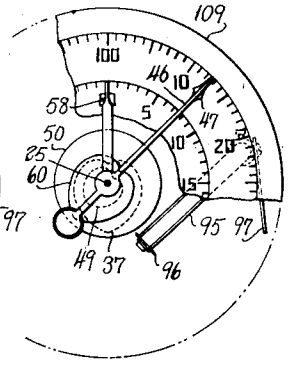


Fig. 7.

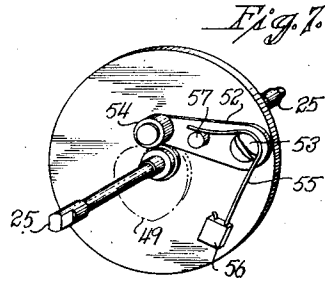


Fig. 11.

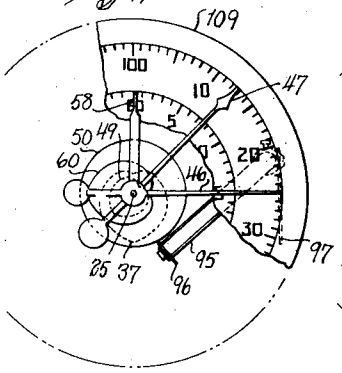


Fig. 12.

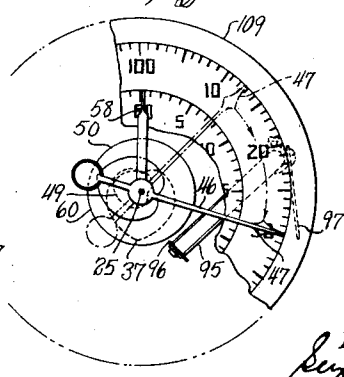
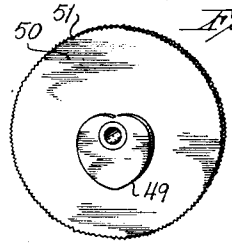


Fig. 8.



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UNITED STATES PATENT OFFICE

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INTERVAL TIMER

Leonard P. Dorsett, Bethlehem, Pa., assignor to The Standard Electric Time Company, Springfield, Mass., a corporation of Connecticut

Application December 3, 1935, Serial No. 52,647

3 Claims. (Cl. 58—75)

This invention relates to improvements in interval-timers or timing-instruments.

One object of this invention is to provide an improved interval-timer capable of performing additional functions over those performed by a stop watch.

Another object of this invention is to provide an interval-timer, the controls of which may be located distant from the main mechanism of the instrument.

Another object of this invention is to provide an improved interval-timer formed of simple elements providing a durable efficient construction.

With the above and other objects in view, this invention includes all improvements over the prior art which are disclosed in this application.

In the accompanying drawings, in which one way of carrying out the invention is shown for illustrative purposes:

Fig. 1 is a front elevation, with the dial and pointers omitted, of one embodiment of the invention;

Fig. 2 is a left-end elevation of Fig. 1;

Fig. 3 is a diagrammatic representation of the motor, controls, and wiring;

Fig. 4 is a fragmental sectional view on line 4—4 of Fig. 1;

Fig. 5 is a perspective view illustrating one of the pointer-resetting constructions;

Fig. 6 is a perspective view illustrating the yieldable connection and resetting-cam construction which normally retains the two stop-pointers in unison;

Fig. 7 is a perspective view of Fig. 6, with the member carrying the heart-shaped cam omitted, but with the heart-shaped cam indicated in broken lines;

Fig. 8 is a reverse perspective view of the member in Fig. 6 carrying the heart-shaped cam;

Fig. 9 is a front elevation of the dial, with all the pointers at the zero or reset position;

Fig. 10 is a view similar to Fig. 9, but with the two stop-pointers shown part-way in their travel;

Fig. 11 is a view similar to Fig. 10, but with one of the stop-pointers stopped in the position shown in Fig. 10, and with the other stop-pointer in a further-advanced position of travel; and

Fig. 12 is a view similar to Fig. 11 after the stopped stop-pointer has been released and permitted to catch up and travel with the other stop-pointer.

In the description and claims, the various parts are identified by specific names for convenience, but they are intended to be as generic in their application as the prior art will permit.

Referring to the drawings illustrating the device, which may be variously referred to as an interval-timer, a stop timing-instrument, a stop clock, or an observation-timer, 20 and 21 are front and rear movement-plates respectively, connected together by pillars 22 in a well-known manner. A synchronous alternating-current motor 23 is secured to the rear movement-plate 21 by means of bolts 24.

The arbor 25 is mounted in the movement-plates 20 and 21 and extends forward from the movement-plate 20 (Figs. 2 and 4). The case 26 of the motor contains reduction-gearing, including a pinion 28 which meshes with and drives a gear 29 mounted for free rotation on the shaft 25. The gear 29 is rigidly secured to a disk 30. The disk 30 carries two lugs or projections 31, 32, which in turn carry a spring-wire 33, which frictionally presses in the groove 34 of the collar 35 rigidly secured to shaft 25 by means of a set-screw 36.

A heart-shaped resetting-cam 37 is secured to a collar or hub 38, which collar or hub is firmly secured to the shaft 25 by means of a set-screw 39. The disk 40 and pinion 41 are rigidly secured to the shaft 25. Pinion 41 meshes with and drives the dial-work gearing 42, 43, carried by the movement-plate 20 and bracket 44 (Fig. 2). The gear 43 is in driving engagement with the gear 45.

A pointer or hand 46 is non-rotatably secured on the shaft 25. Pointer or hand 47 is non-rotatably secured to the sleeve 48, which sleeve 48 has a heart-shaped resetting-cam 49 rigidly secured to the inner end of the sleeve, and also has secured thereto or formed integral therewith a disk 50, which may have its periphery provided with notches 51. Disk 40 has a lever 52 (Fig. 6) pivoted at 53 and carrying a roller 54 adapted to engage the periphery of the resetting-cam 49. The lever 52 is normally yieldably urged to bring its roller 54 in engagement with the heart-shaped resetting-cam 49 by means of the spring 55 which is anchored to the lug 56 on the disk 40 with the free end of the spring 55 pressing against the lug or boss 57 on the lever 52. The heart-shaped re-setting-cam 49, in conjunction with the spring-pressed lever 52 and its roller 54, constitute means which normally reset the pointers 46 and 47 relative to one another, but maintain them in unison, although permitting an indefinite degree of rotation of either of said pointers relatively to the other, during which relative rotation the roller 54 rides along the periphery of the heart-shaped cam. When the force tending to

rotate one of the pointers 46, 47 relative to the other ceases to operate, then the roller 54 causes the cam 49 to rotate until the roller 54 reaches the notch which is the lowest point of the cam, thus bringing the pointers 46 and 47 into unison.

The pointer or hand 58 is rigidly secured to a hub 59, which in turn is non-rotatably secured to the resetting-cam 60, which in turn is non-rotatable relative to the collar or enlarged portion 61 of the sleeve 62. The gear 45 is rotatable relatively to the hub 61 and carries two lugs 63 and 64, which in turn carry a spring 65, which presses in the groove 66 of the hub 61 and thereby frictionally drives the hub 61 and, through the parts described, drives the pointer 58.

Shafts 67, and 68 are pivotally mounted in the movement-plates 20 and 21. Levers 69 and 70 are rigidly secured to shaft 67 and arm 71 is supported on shaft 67, but is free to rotate relative thereto. Arm 69 carries a resetting-roller 72 adapted to engage resetting-cam 60. Arm 70 carries resetting-roller 73 adapted to engage resetting-cam 37.

Arm 71 has a sharp-edged member 74 adapted to engage against the peripheral edge of the disk 30. At the outer end of shaft 68 is an arm or finger-lever 75 rigidly secured thereto and, also rigidly secured on the shaft 68 is an arm 76 having a link 77 pivotally connected to its free end, which link 77 in turn has its lower end pivotally connected to the free end of arm 70. A spring 78 has its upper end connected to a pin 79 fastened to the movement-plate 20 and its lower end connected to the arm 70 to normally lift the latter upwardly until its free outer end engages against the limit-pin 80 which is secured to the movement-plate 20. On the under-side of the arm 70 is a plate 81 which extends transversely beneath the arm 71, so that as the arm 70 is lifted by the spring 78, the plate 81 engages beneath and lifts the arm 71 to thus lift and hold the member 74 out of contact with the disk 30.

The electromagnet 82 has a coil 83 and a magnetic core 84. One end of the core 84 is secured to the U-shaped magnetic metal bracket 85 which is secured to a right-angular-bent portion 85a of the movement-plate 20. The armature 86 is pivoted to the arm 87 of the bracket 85 at 88 and has its lower end 89 connected by means of the spring 90 and adjustable bolt-and-nut members 91, 92, to normally swing the armature 86 away from the core 84 until it is stopped by the limit-finger 93. By properly adjusting the spring 90 by means of the bolt 91 and nut 92, the amount of overrun of the pointer 46 can be made to equal the underrun of the pointer 46. A shaft 94 is pivoted in the movement-plates 20 and 21 and has a right-angular bend forming an arm 95 which carries a sharp-edged member 96 at its end, adapted to engage the fine serrations or notches 51 in the disk 50. The shaft 94 has secured thereto, a leaf-spring 97 adapted to be engaged by the armature 86 to swing the arm 95 up from its normally-lowered-by-gravity position to bring the member 96 into engagement with one of the notches 51.

Electric wires 98, 99 (Fig. 3) are connected to a source of alternating-current supply. The wire 98 leads direct to one terminal 100 of the synchronous alternating-current motor 23. A branch-wire 101 leads from the wire 98 to an observe-switch 102 and thence leads through the electromagnet 82, and thence is joined at 103 to the wire 99. The wire 99 leads through a timer-switch 104 and through a rectifier 105 which is in multiple with the switch 104. A wire then leads from their common junction 106 to the other terminal 107 of the synchronous motor. A condenser 108 is connected across between the wires 98 and 99, as shown. The condenser 108 smooths out the pulsations of current, and when the timer-switch 104 is open to hold the motor stopped by the direct current through the rectifier 105, this smoothing out or lengthening of the direct-current pulsations reduces the tendency toward vibration which might otherwise shift one or more of the pointers from their stopped positions.

The two switches 102 and 104 may, if desired, be located on one or both of the movement-plates, or on a case (not shown) which would ordinarily be used to house the instrument, or the switches may be mounted at a distance from the instrument, thus providing remote control.

The dial 109 preferably has two series of graduation marks 110 and 111 marked thereon, which may represent anything desired; for example, the series of markings 110 may indicate cycles of alternating current or they may indicate hundredths of a minute, or any other markings desired. Each division of the dial markings 111 preferably corresponds to a complete rotation or revolution of the stop-pointers 46 and 47.

In operation, with the wires 98 and 99 connected to a source of alternating-current supply, and with all of the three pointers 46, 47 and 58 located at the starting or zero position 112, as shown in Fig. 9, the instrument is now ready for use in making any desired observations.

On closing the timer-switch 104, the circuit of the synchronous motor 23 is completed, thus starting the motor and causing the pointers 46 and 47 to start their travel clockwise about the dial, as indicated in Fig. 10. If now, the observe-switch 102 is also closed, the circuit through the electromagnet 82 is closed, thus swinging the armature 86, and by engagement of the latter with the spring-arm 97, causing the shaft 94 and its arm 95 to be swung upwardly to bring the sharp-edged member 96 into engagement with one of the notches 51 of the disk 50, thus holding the disk 50, the cam 49, the sleeve 48, and the pointer 47 stationary while pointer 46, shaft 25 and disk 40 continue their rotation, as indicated in Fig. 11, with the roller 54 riding along the periphery of the heart-shaped cam 49. This operation may continue for a part of a revolution or as many complete revolutions as desired.

If it is now desired to stop the pointer 46 in accomplishing a particular timing observation or observations desired, this can be accomplished by opening the timer-switch 104, whereupon current can only reach the motor 23 through the rectifier 105. But, inasmuch as the rectifier 105 permits only those pulsations of current moving in one direction to thus constitute a direct current, this direct current passing through the motor locks the motor so as to suddenly stop it. Thus, for example, pointers 46 and 47 would now be both stationary in positions, such, for instance, as illustrated in Fig. 11.

If it should now be desired to make one or more further timing observations without returning the pointers to the starting point, this can be accomplished by opening the observe-switch 102, whereupon the armature 86 swings to its open position, thus permitting the arm 95 and the member 96 to swing down away from engagement with the disk 50, whereupon the spring-urged roller 54 presses against the periphery of

the heart-shaped cam 49 and causes the cam and its disk 50 and pointer 47 to rotate until the roller rests in the notch of the cam, which is the closest approach the roller 54 can make to the axis of rotation of the cam. This point corresponds with the pointer 47 being in unison with the pointer 46.

If now the timer-switch 104 is closed, alternating current is again permitted to pass through the synchronous motor 23 to promptly start the latter rotating, thus causing the two pointers 46 and 47 to travel in unison clockwise once more, as indicated in Fig. 12. If desired, the pointers 46 and 47 may now again be stopped in a manner similar to that previously described, when the pointers left their zero position 112, in order to make further desired timing observations. The pointer 58 preferably acts in the nature of a counter for the number of revolutions made by the pointer 46, the pointer 58 preferably moving one division on the inner circle of graduations 111 for each complete revolution of the pointer 46.

If it be now desired to bring the pointers to rest in their original position shown in Fig. 9, this can be accomplished by seeing that both switches 102 and 104 are open and then pressing down on the finger-lever 75, whereupon lever-arms 69 and 70 and their rollers 72 and 73 are swung down to respectively press upon and rotate the heart-shaped resetting-cams 60 and 37, which respectively reset pointers 58 and 46 to their original position shown in Fig. 9. As the spring-pressed roller 54 rests in the notch of the cam 49, the pointer 47 travels in unison with the pointer 46 back to its original position, thus bringing all pointers to their original zero position shown in Fig. 9, by one down movement of the finger-lever 75.

A leaf-spring 113 secured to a stud 114, which in turn is secured to the movement-plate 21, yieldably presses against the edge of the disk 30 to inhibit shifting of the latter when it is in a desired stationary position. At the start of the down movement of the lever 70, the cross-bar 81 on the under-side thereof moves down away from and releases the arm 71 to permit the latter to descend by gravity and engage the sharp-edged member 74 with the periphery of the disk 30, to thus add further resistance against undesired rotation of the disk 30, so that when the arms 69 and 70 descend further to bring about the resetting operation, the disk 30 will be held from any possible rotation which may introduce backlash between the gear 29 and the remaining gearing, most of which is not shown and is located in the casing 26.

Development of backlash in this gear-train will not occur if the pointer 46 is returned to its original position from anything less than half a revolution. But if the pointer 46, in the performing of the observations desired, has rotated to a position of more than a half revolution from its original position, then, owing to the manner of resetting due to the heart-shaped cam which accomplishes this result, the pointer 46 will be swung clockwise up to its original position instead of anticlockwise. Such clockwise travel under the resetting action would introduce backlash into the gear-train referred to if the disk 30 and the gear 29 rigidly secured thereto were not held from rotating.

With all the pointers stopped in the position illustrated in Fig. 11, instead of swinging the pointer 47 to unison stopped position with the pointer 46, the pointer 46 can be started to again travel in its clockwise direction by closing the timer-switch 104. Now, while the pointer 46 is traveling, if so desired, the pointer 47 can be brought up to unison with the pointer 46 without stopping the latter but while the latter is continuing its travel, as shown in Fig. 12, by opening the observe-switch 102 which by releasing the armature 86 and arm 95 and disk 50 permits the spring-pressed roller 54 to seek the notch in the cam 49, to thus bring the pointer 47 in unison with the pointer 46, while the latter is traveling, with the result that the two pointers 46 and 47 continue to travel in unison until it is desired to make different observations by stopping one or both of the pointers 46, 47 in ways previously described.

Another mode in which the device can be used is to close the observe-switch 102 to thus lock the pointer 47 at its original zero position at 112, and then close the timer-switch 104 which will cause the pointer 46 to rotate alone for as long as desired, either a part of a revolution of a number of revolutions.

The invention may be carried out in other specific ways than that herein set forth without departing from the spirit and essential characteristics of the invention, and the present embodiment is therefore to be considered in all respects as illustrative and not restrictive, and all changes coming within the meaning and equivalency range of the appended claims are intended to be embraced therein.

I claim:

1. An interval-timer comprising: a synchronous alternating-current motor; a first pointer having a drive connection with said motor; a second pointer having a yieldable connection with said first pointer to normally travel in unison therewith; first control-means including a current-rectifier and a first electric-switch in multiple in the circuit of said motor, said first switch adapted to be closed to cause said first and second pointers to travel in unison, and adapted to be opened to cause direct current only to reach said motor through said rectifier and stop said motor and thus stop the travel of said first and second pointers; second control-means including locking-means for said second pointer and a second electric-switch for said locking-means, said second switch adapted to be closed to stop the travel of said second pointer while said first pointer continues to travel, and adapted to be opened to permit said yieldable connection to cause said second pointer to catch up and travel in unison with said first pointer.

2. An interval-timer comprising: a synchronous alternating-current motor; a first pointer having a drive connection with said motor; a second pointer having a yieldable connection with said first pointer to normally travel in unison therewith; first control-means including a current-rectifier and a first electric-switch in multiple in the circuit of said motor, said first switch adapted to be closed to cause said first and second pointers to travel in unison, and adapted to be opened to cause direct current only to reach said motor through said rectifier and stop said motor and thus stop the travel of said first and second pointers; second control-means including locking-means for said second pointer and a second electric-switch for said locking means, said second switch adapted to be closed to stop the travel of said second pointer while said first pointer continues to travel, and adapted to be

opened to permit said yieldable connection to cause said second pointer to catch up and travel in unison with said first pointer; and reset-means adapted to be actuated to reset both said pointers to a starting point.

3. An interval-timer comprising: a drive-motor; a pointer; a train of gearing driven by said motor and having a friction-drive connection with said pointer; reset-mechanism adapted to reset said pointer to a starting point; and lock-means actuated by said reset-mechanism to prevent the development of backlash in said train of gearing.

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