

PATENT SPECIFICATION

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- (21) Application No. 19483/78 (22) Filed 15 May 1978 (19)
 (31) Convention Application No. 2 726 383 (32) Filed 10 June 1977 in
 (33) Fed. Rep. of Germany (DE)
 (44) Complete Specification published 26 Nov. 1980
 (51) INT. CL.⁸ G04G 5/02 H03K 21/06
 (52) Index at acceptance
 G3T KC KD
 G4D 442 CM



(54) ADJUSTMENT MEANS FOR ADJUSTING AN ELECTRONIC DIGITAL INDICATOR

(71) We, DIEHL GmbH & Co., formerly known as Diehl, of Stephanstrasse 49, 8500 Nürnberg, Germany, a Kommanditgesellschaft organised under the laws of the Federal Republic of Germany, the present personally-responsible Partner being Süd-deutsches Metall-Kontor G.m.b.H., do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to adjustment means for adjusting an electronic digital indicator in an electronic apparatus or device, more especially but not exclusively time-measuring means. There is described herein adjustment means having an impulse generator which is actuatable by at least one operating element, and which comprises an impulse transmitter, having one or more impulse-producing elements and a sensing element or an electrically active counter-element, said impulse-producing element or elements and said counter-element or sensing element being relatively movable for the production of electrical impulses of variable impulse frequency for the adjustment of an indication.

Adjustment means of such construction is described and claimed in our British Patent Specification No. 1,510,744. There a number of impulse generators are described with which impulses for the adjustment of an electronic digital indicator can be produced. Some of these impulse generators are, however, restricted in their input speed to about 200 impulses per second. This means on the one hand that upon the adjustment of an indicator of time-measuring means by several hours the impulse generator has to make a considerable number of revolutions before the desired indicated value is reached. This represents an inconvenience for the operator.

The input speed of the impulse generator cannot be increased without special measures, since on the one hand mechanical contact problems, more especially chatter, and on the other hand in certain circumstances also processing time problems relating to the

electronic system, stand in the way of this. The latter can occur if there is used a microprocessor which, in addition to the processing of the input impulses for the digital indicator, also has to carry out a series of control functions for the electronic apparatus. These various functions may be carried out by the microprocessor programme in a series of cycles in such a way that in each programme cycle relevant data, for example the data stemming from the aforesaid impulse generator, are interrogated. The microprocessor thus has only during a short span of time within its programme cycle time in which to interrogate the data of the impulse generator, whereas the time interval up to the next programme cycle is relatively long. If now the impulse production by the impulse generator is effected very rapidly, then the impulses produced fall into that time interval in which the microprocessor is not interrogating the impulse generator. The corresponding impulses are then lost.

It is the task of the invention to provide indicator adjustment means which, using known or other suitable impulse generators, easily and conveniently makes possible a very rapid input of impulses and thereby reduces the time for the adjustment of the indication.

According to the invention, there is provided adjustment means for adjusting an electronic digital indicator in an electronic apparatus or device, more especially but not exclusively time-measuring means, having an electronic counting device with one or more digit counters, said adjustment means having an impulse generator having parts which are relatively movable for, or in connection with, the production of electrical impulses of variable impulse frequency for the adjustment of an indication, characterised in that there is provided a discriminator which ascertains whether the impulse frequency of the impulses produced by the said impulse generator exceeds a predetermined limiting value, and which is arranged to cause an increased or additional number of adjusting impulses to be sup-

plied to said indicator in the event of such an exceeding of the limiting value.

There can come into action, from a specific impulse frequency of the impulses produced by the said impulse generator of the adjustment means, an electronic frequency generator which produces, in defined manner and substantially faster than the said impulse generator, impulses which are transmitted to the indicator. This means that as from this impulse frequency the impulse production can become independent of the input impulses. The indicator can in this way be adjusted very rapidly even over several hours.

Preferably, in the case of adjustment means in which the said impulse generator referred to in the penultimate preceding paragraph hereof has a plurality of impulse-producing elements and there is provided a sensing element for scanning the impulse-producing elements, with the impulse-producing elements and the sensing elements being relatively rotatable manually or by a motor, the discriminator is connected electrically to the sensing element which scans the impulse-producing elements.

In the case of such an embodiment, an impulse wheel which is adjustable manually or by a motor can be used to produce the adjusting impulses for the indicator.

Within the scope of the invention, however, it would also be possible for said impulse generator to comprise an oscillator, a linearly-displaceable lever with one or more slide contacts, and a resistance slide track arranged in the manner of potentiometer, with said slide contact or contacts being movable relatively to said slide track to control a change of the impulse frequency of said oscillator by a change of the oscillator circuit resistance.

In a further preferred version of the invention, it is possible to derive the increased or additional adjusting impulses from an arrangement, such as for example a frequency divider or a multiplexer for the indicator, which has a function additional to that of providing said increased or additional adjusting impulses and which produces pulses of a higher frequency than the predetermined limiting frequency.

Also, according to the invention, there is provided adjustment means for adjusting an electronic digital indicator in an electronic apparatus or device, said means comprising a rotatable member rotatable to effect an adjustment of the indicator and the arrangement being such that an increase in the rate of rotation of said rotatable member bringing said rate of rotation past a predetermined value thereof causes an increase in the rate of adjustment of the indicator which is overproportionate to said increase in the rate of rotation.

Adjustment means constructed and arranged as set forth in the last preceding paragraph hereof may, for example, be for adjusting a digital time display of electronically-controlled time-measuring means, in which case the adjustment of the indicator effectable by rotation of the rotatable member would be manifest as a change of time setting.

In the accompanying drawings, which show, by way of example, several embodiments of the invention:—

Figure 1 shows an impulse wheel for use as an impulse generator in adjustment means constructed in accordance with the invention;

Figure 2 shows a first exemplary embodiment of the invention, in which an RC device is provided as a time-determining device in a discriminator;

Figure 2a shows an impulse diagram with regard to the exemplary embodiment in accordance with Figure 2;

Figure 3 shows a second exemplary embodiment of the invention in which a shift register is provided as a time-determining device in a discriminator;

Figure 3a shows the impulse diagram with regard to the exemplary embodiment in accordance with Figure 3;

Figure 4 shows a third exemplary embodiment of the invention, using a discriminator in accordance with Figure 2 and a frequency multiplier;

Figure 4a shows a possible form of frequency multiplier;

Figure 4b shows an impulse diagram with regard to the exemplary embodiment in accordance with Figure 4;

Figure 5 shows a flow diagram relating to a fourth exemplary embodiment of the invention; and

Figure 6 shows a circuit arrangement for discriminating between forwards and backwards counting impulses of a further impulse generator.

Referring to the drawings, there is indicated by 1 in Figure 1 an impulse generator for producing adjusting impulses in which an impulse wheel 2 consists of insulating material, preferably wear-resistant plastics material, into the body of which there is formed an electrically conductive contact ring 3 with a plurality of electrically conductive contact laminations 4 arranged thereon in star-shaped manner. These contact laminations lead radially outwards to a smooth peripheral surface of the impulse wheel 2, where they have external laterally-directed surfaces forming contact surfaces 5 for impulse production. Provided as a sensing element is a spring contact 6 which butts against the smooth peripheral surface of the impulse wheel 2 and past whose tip 6a the contact surfaces of the impulse wheel can

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slide in chatter-free manner upon the rotation of said wheel. This spring contact 6 and a spring contact 7 sliding on the contact ring 3, and via which an electrical circuit for an impulse transmission is closable, are formed as leaf springs which are clamped at one end and the inner ends of which are connected to an impulse shaper 8. Arranged subsequent to the impulse shaper 8 is a signal path change-over switch 9 which communicates with a change-over device 10 for forwards and backwards counting impulses. This device has an arm 11 on a disc 12 frictionally coupled to the impulse wheel 2. Depending on the direction of rotation of the impulse wheel 2, the arm 11 butts against a contact 10a or a contact 10b of the change-over device 10 and transfers the forwards or backwards impulses of the impulse wheel to the one or to the other contact. Indicated by 13 is a stop spring which engages into a stop toothing 14 on the impulse wheel 2.

This impulse generator is preferably suitable for the adjustment of a digital indicator of a timepiece, but quite generally also for the adjustment of the indicator of an electronic apparatus. The representation and description of such an indicator—e.g. a liquid crystal or LED indicator—and of an impulse generator, for producing counting impulses, of the apparatus (quartz or mains frequency impulse transmitter) and of digit counters of the apparatus is dispensed with at this point, since these means are known "per se". Said generator for producing counting impulses will be hereinafter referred to in this description as "the counting-impulse generator" to distinguish it from the adjustment-impulse generator 1.

Shown in Figure 2 is a first exemplary embodiment of the invention in which the impulses produced by an impulse generator in accordance with Figure 1 are investigated to see whether they fall below a predetermined limiting frequency or not. Serving for this purpose is an RC device whose charging state during the impulse interval of two consecutive input impulses serves for the discrimination of the limiting frequency.

A charging capacitor 20 is connected, via a charging resistor 21, to the terminal 10a of the output of the impulse generator 1. A discharge resistor 22 serves for the discharge of the capacitor 20. Indicated by 23 is a D-flip-flop, with a timing input 23a, an information input 23b, a reset input 23c, a true output 23e and a negated output 23d. Connected between the inputs 23b and 23c of the flip-flop is a negating threshold-value device 24, e.g. a Schmitt trigger device. Arranged at the outputs 23d and 23e of this flip-flop are respective NAND gates 25 and 26, and a NAND gate 27. Connected subsequent to the output of the latter is a counter 28, which is a digit counter of the

electronic apparatus, e.g. the minutes counter of a timepiece. Finally, a further impulse generator 29 is provided which produces a higher frequency than the permitted limiting frequency; e.g. the frequency of this impulse generator 29 may amount to 600 Hz. This impulse generator may be an independent impulse source, but it may, within the scope of the invention, also emit a frequency which is derived from the counting-impulse generator of the electronic apparatus, in other words for example the quartz or the mains-frequency impulse transmitter.

The mode of operation of the exemplary embodiment in accordance with Figure 2 will now be explained in more detail with reference to the diagram constituting Figure 2a. In this respect, there are indicated at the individual impulse trains shown in Figure 2a the reference numerals of those component parts of Figure 2 at whose outputs the corresponding impulses occur.

If an input impulse occurs at the terminal 10a of the impulse generator 1, then this is applied on the one hand via the charging resistor 21 to the capacitor 20, and on the other hand to the timing input 23a of the flip-flop 23. The leading edge of this impulse cannot change over the flip-flop, since at this point in time there is applied to the input 23c a reset signal which disappears only after increasing charging of the capacitor 20, namely when the threshold of the threshold-value device 24 is exceeded. The signal at the input 23b remains ineffective, and no signal arises at the output 23e. The signal at the output 23d, on the other hand, persists and brings about, via the NAND gates 25 and 27, the switching-through of the input signal to the counter 28. After conclusion of the input signal 10a, the capacitor 20 is discharged and, when the voltage of capacitor 20 falls below the threshold of the threshold-value device 24, a reset signal appears again at the input 23c of the flip-flop. The signal at the input 23b disappears.

When the leading edge of a further input signal now appears at the terminal 10a, then the procedure already explained above is repeated. However, this signal has a considerably shorter duration and a considerably shorter following impulse interval than the preceding signal, so that at this stage the capacitor cannot be discharged to such an extent that its voltage falls below the switching threshold of the threshold-value device 24. Since, now, upon the next-following input impulse at the terminal 10a, no reset signal is applied to the input 23c, the leading edge of this input signal can now change-over the flip-flop 23 and a signal now appears at the output 23c whereas the signal at the output 23d of the flip-flop disappears. This change-over of the flip-flop 23 corres-

ponds to the criterion that the input impulse frequency was higher than the permitted limiting frequency and now the increased impulse frequency of the further impulse generator 29 is switched forward via the NAND gate 26 and the NAND gate 27 to the counter 28. As is evident from Figure 2a, this input impulse and the following impulse intervals are longer than in the case of the limiting frequency, so that now the discharge of the capacitor 20 can progress to such an extent that the capacitor voltage falls below the switching threshold of the threshold-value device 24 and there again appears at the input 23c of the flip-flop 23 a reset signal which resets the flip-flop 23. The impulse frequency of the following input impulses is considerably higher than the limiting frequency and the discharge of the capacitor is therefore not effected to such an extent that the voltage falls below the switching threshold of the threshold-value device 24. This means that now the flip-flop 23 is again changed-over and the increased impulse frequency of the impulse generator 29 is switched through to the counter 28.

From the foregoing explanation it emerges that the circuit arrangement in accordance with Figure 2 works as a discriminator for higher or lower frequencies than the permitted limiting frequency and that, because of the switching-through of the higher-frequency impulses of the impulse transmitter 29 to the counter 28, there appears there a considerably higher number of adjusting impulses than have been produced by the impulse transmitter. In this way a very rapid adjustment of the digital indicator is possible.

Shown in Figure 3 is a second exemplary embodiment of the invention in which there is provided as time-determining means in the discriminator a store for four impulses and which collaborates with a logical linkage circuit connected subsequent thereto. A store 30, which may either be designed as a shift register or else as a counter, constantly receives from the further impulse generator 29—which may for example be the same impulse source as in the case of the exemplary embodiment in accordance with Figure 2—impulses supplied to the input 30a of said store. The terminal 10a is connected via a differentiating device 31, 32 and an inverter 33 to the reset input 30b of the store 30. The output 30c of the store is connected via a negator 34 and an AND gate 35 to the store input 30a, in order to be able to block this input against further impulses of the impulse generator 20 when, after storing of the fourth impulse, an output signal arises at its output.

Connected subsequent to the output of the store 30 and a NOR gate 36, an inverter 37,

and two NAND gates 38 and 39. The counter 28 is connected to the output of the latter.

As emerges from the relevant diagram in Figure 3a, the impulses from the terminal 10a are always applied to the input of the counter 28—namely the forwards counting input thereof—when the impulse length on terminal 10a is greater than the write-in time of four impulses into the store 30. In such a case, namely always at the start of a fresh impulse on 10a, reset impulses 30b are produced which define the beginning of the write-in operation of the counter 30 in that the output signal at 30c disappears. If now the impulse length on 10a is less than the write-in time of the store 30, then the output signal on 30c is still nil, whereas the impulse on 10a is already concluded. This means that in the NAND gate 38 an impulse of the frequency generator 29 is passed as an additional stepping impulse to the counter 28.

It is evident from the diagram that, upon very rapid rotation of the impulse generator 1, in other words for very short pulses on 10a, the number of the additional impulses for the stepping-on of the counter 28 is approximately doubled.

Shown in Figure 4 is a third exemplary embodiment of the invention, in which used as the discriminator 40 is an arrangement, similar to that of Figure 2 and such that the outputs 40a and 40b of the discriminator in Figure 4 correspond to the outputs 23d and 23e of the flip-flop 23 in Figure 2. Instead of the further impulse frequency generator 29, a frequency multiplier 41 is provided, which performs a quadrupling of the impulses 10a.

Shown in Figures 4a and 4b is the arrangement and mode of operation of the frequency multiplier. It is evident from Figure 4a that the impulses 10a are differentiated at their leading and trailing edges by the capacitors 42a and 42b, so that two impulses 42 arise from one impulse 10a. These impulses are, via inverters 43a and 43b, fed to further differentiating capacitors 44a, 44b, 44c, 44d, whereby, through a renewed leading and trailing edge differentiation, altogether four impulses have arisen from one original timing impulse 10a. In subsequent inverters 45a, 45b, 45c, 45d, these signals are inverted and linked via a NOR gate 46.

If the impulse generator 1 is connected by its terminals 10a and 10b to a microprocessor, then the discrimination of the exceeding of the limiting value by the impulse frequency of the input pulses can be effected by the microprocessor programme. A flow diagram showing the manner in which this can happen is shown in Figure 5. In each complete programme run-through in the microprocessor, the programme shown in

Figure 5 is run through once in a certain time interval. These intervals of time are adapted to the impulse limiting frequency indicated at the beginning. At the start of each programme run-through, the criterion for counting is set and the input 10a or 10b respectively is interrogated as to whether a signal is present ("input high?") If the input is not "high", thus in other words is "low", then the first "low" cycle will run through, while the criterion for counting is reset and a possibly set criterion for large spacing of the impulses 10a or 10b respectively is also reset. Then the rest of the programme of the microprocessor is carried out within one cycle and then, i.e. after for example about five milliseconds, the input is again interrogated "input high?". If the answer reads "no", then now, since the criterion for counting is now no longer set, the second "low" cycle will run through and the criterion for large spacing of the impulses 10a or 10b respectively is set. If the input has, twice, not been "high", then this is the criterion for a large spacing of the impulses 10a or 10b respectively, in other words for a lesser impulse frequency than corresponds to the limiting value. Only upon the third query "input high?" is in this case the answer "yes", so that now the right-hand part of the flow diagram will run through. The criterion for counting is in this case not set, so that now this criterion has to be set. Furthermore, the criterion for large spacing in the second "low"-cycle has already been set, so that the corresponding question is answered by "yes", which means that a "one" has to be counted into the counter.

If, on the other hand, upon the second run-through of the programme cycle, the input has already been "high", which means that the second "low"-cycle has not been run through, then in this case the right-hand part of the flow diagram is at once run through, in which respect in this case the criterion for large spacing of the impulses has not been set, since indeed the second "low"-cycle had not been run through. This means that now three impulses have to be counted into the counter 28, as a sign that the impulse frequency of the impulses 10a or 10b respectively has exceeded the limiting frequency.

In the event that there is to be effected with the impulse wheel of the impulse generator 1 an adjustment of the indicator forwards and backwards, the impulses must be picked up at the terminals 10a or 10b respectively of the said pulse generator 1. In such a case, the counter 28 is to be used with a forwards and a backwards counting input. The circuit shown in Figure 6 serves for the selecting of the "correct" input of the counter 28, dependent on whether the

impulses appear at the terminal 10a or at the terminal 10b of the forwards/backwards change-over switch 10. Indicated by D is, in this respect, a discriminator which comprises an arrangement in accordance with Figures 2 or 3 including the further pulse generator 29 and excluding the counter 28. Connected subsequent to the discriminator D are NAND gates 60, 61 and 62; indicated by 63 is an inverter which inverts the reset signal.

WHAT WE CLAIM IS:—

1. Adjustment means for adjusting an electronic digital indicator in an electronic apparatus or device having an electronic counting device with one or more digit counters, said adjustment means having an impulse generator having parts which are relatively movable for, or in connection with, the production of electrical impulses of variable impulse frequency for the adjustment of an indication, characterised in that there is provided a discriminator which ascertains whether the impulse frequency of the impulses produced by the said impulse generator exceeds a predetermined limiting value and which is arranged to cause an increased or additional number of adjusting impulses to be supplied to said indicator in the event of such an exceeding of the limiting value.

2. Adjustment means as claimed in Claim 1, wherein the said impulse generator has a plurality of impulse-producing elements and there is provided a sensing element for scanning the impulse-producing elements, said impulse producing elements and said sensing element being relatively rotatable manually or by a motor, characterised in that the discriminator is connected electrically to the said sensing element which scans the impulse-producing elements.

3. Adjustment means as claimed in Claim 1 or 2, characterised in that present in the discriminator is a logical linkage circuit which is able to connect a further impulse generator to a digit counter for the indicator for the purpose of the adjustment thereof.

4. Adjustment means as claimed in Claim 3, characterised in that the discriminator has a timing device, e.g. an RC device, subsequent to which is connected the logical linkage circuit, and in that the further impulse generator can be connected by this linkage circuit to the digit counter for the indicator when two impulses of the first-mentioned impulse generator follow one another at a spacing which is less than a time determined by the timing device.

5. Adjustment means as claimed in Claim 3, characterised in that the discriminator has a store, such as for example a counter or shift register, which is suitable for the intermediate storage of a predeter-

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Figure 5 is run through once in a certain time interval. These intervals of time are adapted to the impulse limiting frequency indicated at the beginning. At the start of each programme run-through, the criterion for counting is set and the input 10a or 10b respectively is interrogated as to whether a signal is present ("input high?") If the input is not "high", thus in other words is "low", then the first "low" cycle will run through, while the criterion for counting is reset and a possibly set criterion for large spacing of the impulses 10a or 10b respectively is also reset. Then the rest of the programme of the microprocessor is carried out within one cycle and then, i.e. after for example about five milliseconds, the input is again interrogated "input high?". If the answer reads "no", then now, since the criterion for counting is now no longer set, the second "low" cycle will run through and the criterion for large spacing of the impulses 10a or 10b respectively is set. If the input has, twice, not been "high", then this is the criterion for a large spacing of the impulses 10a or 10b respectively, in other words for a lesser impulse frequency than corresponds to the limiting value. Only upon the third query "input high?" is in this case the answer "yes", so that now the right-hand part of the flow diagram will run through. The criterion for counting is in this case not set, so that now this criterion has to be set. Furthermore, the criterion for large spacing in the second "low"-cycle has already been set, so that the corresponding question is answered by "yes", which means that a "one" has to be counted into the counter.

If, on the other hand, upon the second run-through of the programme cycle, the input has already been "high", which means that the second "low"-cycle has not been run through, then in this case the right-hand part of the flow diagram is at once run through, in which respect in this case the criterion for large spacing of the impulses has not been set, since indeed the second "low"-cycle had not been run through. This means that now three impulses have to be counted into the counter 28, as a sign that the impulse frequency of the impulses 10a or 10b respectively has exceeded the limiting frequency.

In the event that there is to be effected with the impulse wheel of the impulse generator 1 an adjustment of the indicator forwards and backwards, the impulses must be picked up at the terminals 10a or 10b respectively of the said pulse generator 1. In such a case, the counter 28 is to be used with a forwards and a backwards counting input. The circuit shown in Figure 6 serves for the selecting of the "correct" input of the counter 28, dependent on whether the

impulses appear at the terminal 10a or at the terminal 10b of the forwards/backwards change-over switch 10. Indicated by D is, in this respect, a discriminator which comprises an arrangement in accordance with Figures 2 or 3 including the further pulse generator 29 and excluding the counter 28. Connected subsequent to the discriminator D are NAND gates 60, 61 and 62; indicated by 63 is an inverter which inverts the reset signal.

WHAT WE CLAIM IS:—

1. Adjustment means for adjusting an electronic digital indicator in an electronic apparatus or device having an electronic counting device with one or more digit counters, said adjustment means having an impulse generator having parts which are relatively movable for, or in connection with, the production of electrical impulses of variable impulse frequency for the adjustment of an indication, characterised in that there is provided a discriminator which ascertains whether the impulse frequency of the impulses produced by the said impulse generator exceeds a predetermined limiting value and which is arranged to cause an increased or additional number of adjusting impulses to be supplied to said indicator in the event of such an exceeding of the limiting value.
2. Adjustment means as claimed in Claim 1, wherein the said impulse generator has a plurality of impulse-producing elements and there is provided a sensing element for scanning the impulse-producing elements, said impulse producing elements and said sensing element being relatively rotatable manually or by a motor, characterised in that the discriminator is connected electrically to the said sensing element which scans the impulse-producing elements.
3. Adjustment means as claimed in Claim 1 or 2, characterised in that present in the discriminator is a logical linkage circuit which is able to connect a further impulse generator to a digit counter for the indicator for the purpose of the adjustment thereof.
4. Adjustment means as claimed in Claim 3, characterised in that the discriminator has a timing device, e.g. an RC device, subsequent to which is connected the logical linkage circuit, and in that the further impulse generator can be connected by this linkage circuit to the digit counter for the indicator when two impulses of the first-mentioned impulse generator follow one another at a spacing which is less than a time determined by the timing device.
5. Adjustment means as claimed in Claim 3, characterised in that the discriminator has a store, such as for example a counter or shift register, which is suitable for the intermediate storage of a predeter-



mined number of impulses, for example four impulses, of the further impulse generator and in that the logical linkage circuit is connected subsequent to the store and is such that, when two impulses of the first-mentioned impulse generator follow one another in a shorter time than corresponds to the write-in time of the predetermined number of impulses in the store, it adds the impulses of the further impulse generator to those of the impulse train of the first-mentioned impulse generator.

6. Adjustment means as claimed in Claim 1 or 2, characterised in that provided in said adjustment means is a further impulse generator, said further impulse generator being connectable to the indicator by the discriminator in the event of exceeding of the predetermined limiting value to supply adjusting impulses to the indicator.

7. Adjustment means as claimed in Claim 6, characterised in that the further impulse generator provided in the adjustment means is a frequency divider.

8. Adjustment means as claimed in Claim 3, 4 or 5, characterised in that the further impulse generator is provided in said adjustment means.

9. Adjustment means as claimed in Claim 1, characterised in that a microprocessor is provided as the discriminator.

10. Adjustment means as claimed in Claim 1, characterised in that the said impulse generator comprises an oscillator, a linearly-displaceable lever with one or more slide contacts, and a resistance slide track arranged in the manner of a potentiometer, said slide contact or contacts being movable relatively to said slide track to control a change of the impulse frequency of said oscillator by a change of the oscillator circuit resistance.

11. An electronic apparatus or device having an electronic counting device with one or more digit counters, and having adjustment means constructed in accordance with Claim 1, characterised in that said apparatus or device includes a further impulse generator, in that said increased or additional adjusting impulses are derived from said further impulse generator, and in that said further impulse generator has a function in said apparatus additional to that of providing said increased or additional adjusting impulses.

12. An electronic apparatus or device having adjustment means constructed in accordance with Claim 1, wherein said appa-

ratus or device has an electronic counting device with one or more digit counters, and has a first impulse generator for producing counting impulses, a second impulse generator constituting the said impulse generator of the adjustment means, and a third impulse generator constituting a further impulse generator of the adjustment means, said third impulse generator being connectable to the indicator by the discriminator in the event of exceeding of the predetermined limiting value to supply adjusting impulses to the indicator.

13. An electronic apparatus or device as claimed in Claim 12, characterised in that there is used as said third impulse generator an arrangement—such as for example a frequency divider or a multiplexer for the indicator—which emits a frequency which is derived from the said first impulse generator and is higher than the predetermined limiting frequency.

14. An electronic apparatus or device as claimed in Claim 12 or 13, wherein said apparatus or device is time-measuring means.

15. Adjustment means for adjusting an electronic digital indicator in an electronic apparatus or device, said means comprising a rotatable member rotatable to effect an adjustment of the indicator and the arrangement being such that an increase in the rate of rotation of said rotatable member bringing said rate of rotation past a predetermined value thereof causes an increase in the rate of adjustment of the indicator which is over-proportionate to said increase in the rate of rotation.

16. Adjustment means as claimed in Claim 15, wherein said rotatable member is rotatable in one direction to effect a forwards adjustment of the indicator and in the opposite direction to effect a backwards adjustment of the indicator.

17. Adjustment means as claimed in Claim 15 or 16, wherein said adjustment means is for adjusting a digital time display of electrically-controlled time-measuring means.

18. Adjustment means for adjusting an electronic digital indicator, substantially as herein described with reference to the accompanying drawings.

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