(12) UK Patent Application (19) GB (11) 2 065 392 A

(21) Application No **8034684**
(22) Date of filing
28 Oct 1980
(30) Priority data
(31) **2944526**
(32) **3 Nov 1979**
(33) **Fed Rep of Germany (DE)**
(43) Application published
24 Jun 1981
(51) **INT CL³ B60Q 1/38**
(52) Domestic classification
H2H 31 32 33 35 36 SV1 SV2
(56) Documents cited
GB 1435917
GB 1419427
GB 1405594
GB 967959
(58) Field of search
H2H
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(54) Vehicle flasher unit

(57) In an electronic direction indicator flasher unit (10) for a motor vehicle, the mark-to-space ratio and/or the frequency of the pulses produced by the unit are variable in dependence on control signals applied to inputs (11 to 18). When the direction indicator lamp current is unduly high, especially in the case of a short-circuit, the mark-to-space ratio is automatically reduced so as to avoid battery-drain and overheating of the circuit, thus avoiding the need for a fuse. Either a single controllable pulse generator or a plurality of separate pulse generators (40–50) connected to a clock generator (51) may be used. Control may be responsive to hazard warning operation, use of vehicle lighting, speed, acceleration, braking or presence of a defective lamp. A microprocessor may control the flasher unit and other vehicle functions.

Fig. 1

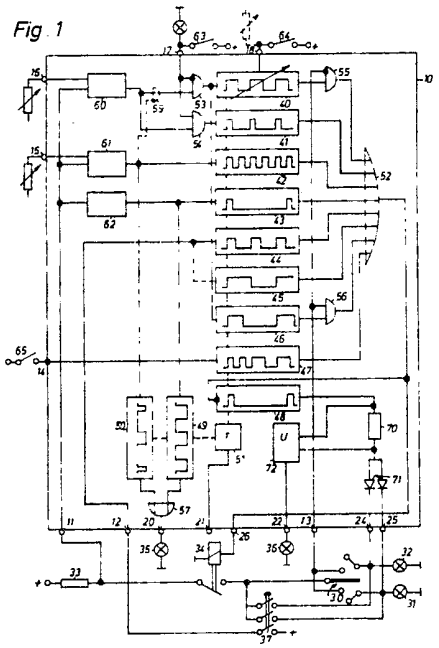

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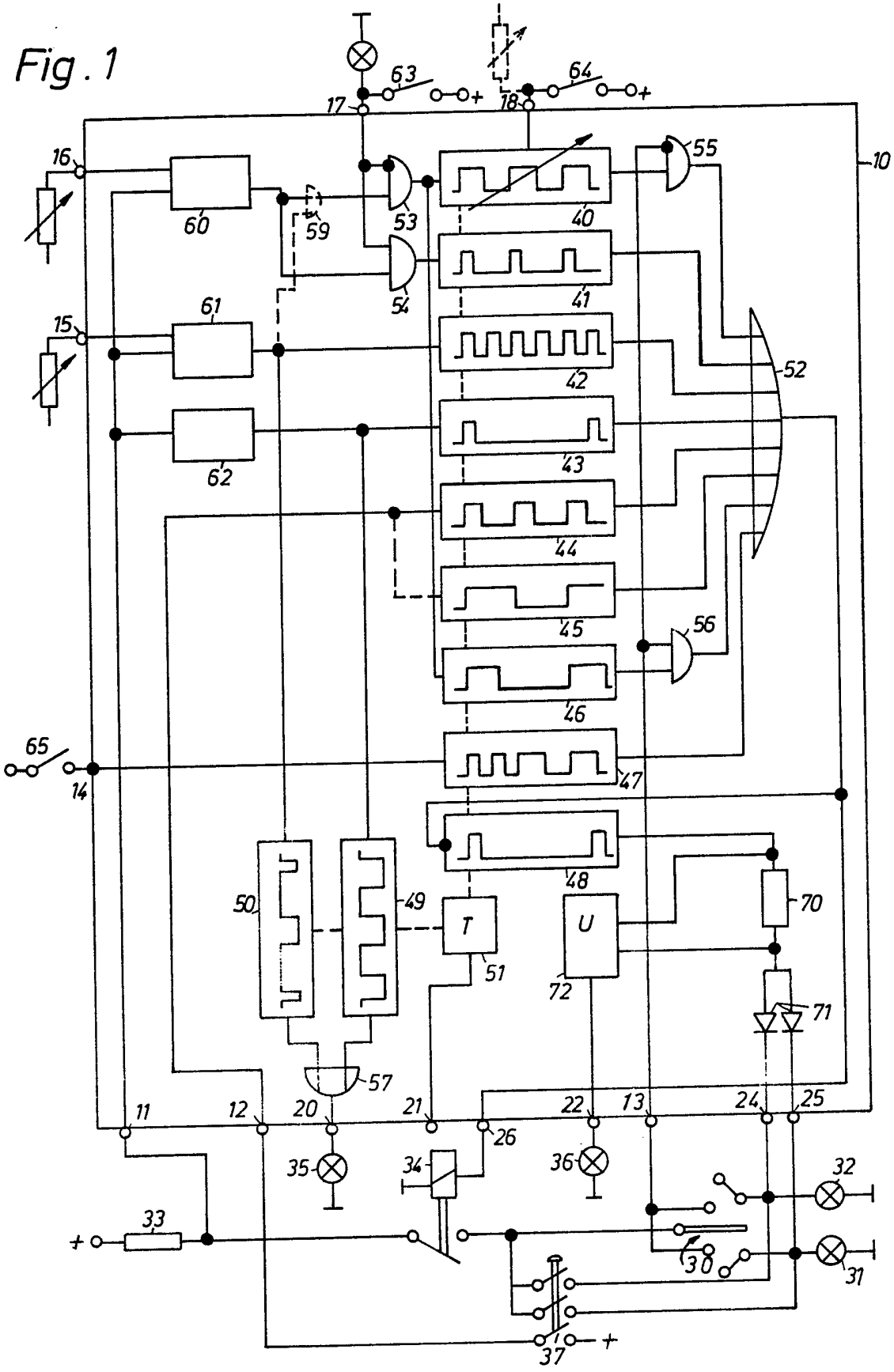
Fig. 1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SPECIFICATION

Vehicle flasher unit

The present invention refers to a flasher unit for a direction indicator in a motor vehicle. Such flasher units normally deliver a pulse-type output signal which controls one of two direction indicator lamp circuits when the direction indicator switch is switched on.

Conventional flasher units usually provide the following functions:

When the direction indicator switch is actuated, an output signal with a frequency of approximately 90 pulses per minute is created, whereby the light period, i.e. the time interval in which the signal lamps are supplied with voltage, lasts for about 50 per cent of the cycle. Such a flasher signal is easily recognisable in daylight, but the danger of dazzling is present when it is dark. In order to indicate a faulty signal lamp the frequency of the pulse-form output signal is doubled, whereby the mark-to-space ratio remains unchanged. Some direction indicator flasher units are also suitable for controlling all direction indicator lamp circuits on the right-hand and left-hand sides of the vehicle upon actuation of the hazard-warning-signal switch. Thereby the output signal corresponds to the direction indicator signal when the turn-signal system is in order. The information to be gained from flashing signals of known direction-indicator systems is no longer sufficient for today's traffic.

Usually the direction indicator lamp circuits are looped into fuses. If the filament lamp is exchanged improperly or the lamp is destroyed in an accident this fuse may well be destroyed by the short-circuit occurring. Thereafter, it is a disadvantage that the turn-signal lamp circuit continues to be interrupted, even if the short-circuit current is eliminated. Because not every motorist has a spare fuse on hand and it is also tiresome to change the fuses of some types of vehicles driving is often continued with a defective direction indicator system until the next service station is reached. Road safety may thus be impaired.

Therefore the invention has for its principal object to create a flasher unit for a direction indicator system which does not have the above mentioned disadvantages and thus makes a contribution to improve road safety.

According to the invention in its broadest aspect there is provided a flasher unit for a direction indicator system in a motor vehicle, the pulse-form output signal of which controls one of two direction indicator lamp circuits when the direction indicator switch is switched on, characterised in that the mark-to-space ratio, that is the light period of the output signal related to the cycle duration, is variable in dependence on control signals at the inputs of the flasher unit.

By changing the mark-to-space ratio of the output signal, signals can be produced with different conditions or operations which can be clearly distinguished. Thus more information is given to other road users than has been possible until now, in the interest of road safety. Due to a reduction of the mark-to-space ratio, other road users are no longer dazzled when it is dark. So far as direction indicator systems are concerned in which both direction indicator lamp circuits are controlled by the direction indicator flasher, when the hazard-warning signal switch is switched on, by a reduction of the mark-to-space ratio one can reduce the current consumption and thus save energy. With a given capacity of the vehicle battery, the hazard-warning signal operation can thus be maintained longer, which also makes a contribution to road safety.

The proposal for substituting a kind of electronic fuse for the fuses used until now is also based on the idea of changing the mark-to-space ratio. In an advantageous embodiment of the invention with an extremely high operating current, the mark-to-space ratio of the output signal is for this purpose reduced in such a way that short pulses are only released at longer time intervals. Thereby the mark-to-space ratio is selected to be so small that the battery is not excessively loaded by the short-timed current flow and no unduly high heating-up of the current-carrying leads to the direction indicator lamps will occur. If now, the short-circuit is eliminated and a lower operating current is again detected with the next measuring operation the direction indicator system can immediately take over its normal function.

Within the ambit of the present invention it is also possible to increase the number of possible differing signals by changing the frequency of the pulse-type output signal of the direction indicator flasher. The frequency can depend on the driving speed or on the acceleration of the vehicle. Thus the attention of road users can be drawn to a braking operation by an increased frequency of the output signal. Other road users would be able to assess the speed of a vehicle in front or behind by means of the frequency of the output signal. All these measures are a means to the end of increasing road safety.

An embodiment of the invention will now be described by way of example with reference to the accompanying drawing in the form of a circuit diagram.

The direction indicator system of a vehicle comprises a flasher unit as a whole designated by 10 with control inputs 11 to 18 and outputs 20 to 26, a direction indicator switch 30 through which the direction indicator lamps 31 and 32 may be controlled, a measuring resistor 33, a switching element 34 in the form of a relay and two pilot lamps 35

and 36 as well as a hazard-warning-signal switch 37.

The flasher unit includes several pulse generators 40 to 50 which are producing signals with differing mark-to-space ratios and/or frequencies as shown in the drawing. The signals of these pulse generators are derived from the signal of a central clock generator 51 as is indicated by the dotted connection between the clock generator and the pulse generators. The signals of the pulse generators 40 to 47 are conducted to an OR-gate 52 which controls the relay 34 via the output 26 of the flasher unit 10. The switch contact of the relay 34 is looped into the direction indicator lamp circuit. When the relay is energised and the direction indicator switch 30 is brought into one of its operating positions, one of the lamp circuits to the direction indicator lamps 32 or 31 is closed, so that the operating current flows through the measuring resistor 33.

The pulse generator 40 normally produces a signal with a frequency of 90 pulses per minute and a mark-to-space ratio of 50 per cent. This signal is switched onto the output 26 as will be described below.

The pulse generator 41 produces a signal the frequency of which is the same as that of the pulse generator 40, but the mark-to-space ratio is reduced. The light period or the pulse time of the individual pulses is shorter. The signal of the pulse generator 41 is switched onto the output 26, if a direction indicator signal flashing is to be indicated with a direction indicator system, but the brightness of the surrounding area falls below a given value.

The pulse generator 42 produces a signal the frequency of which is about twice as high as that of the signal of the pulse generator 40. The mark-to-space ratio amounts to about 50 per cent. This signal is switched onto the output 26, when one filament lamp is defective during direction indicator operation.

The pulse generator 43 produces a pulse sequence with a very small mark-to-space ratio. The pulse interval has the duration of a few seconds. This signal is evaluated in case the operating current in the direction indicator lamp circuit assumes an unduly high value.

The pulse generator 44 produces a signal the mark-to-space ratio of which is reduced in comparison with that of the pulse generator 40. This signal is evaluated when the hazard-warning-signal switch 37 is actuated. Due to the reduced mark-to-space ratio which, however, is sufficient to secure a recognisable light signal in accordance with the regulations, the current capability during hazard-warning operation is considerably reduced. A similar effect can also be achieved if one reduces the frequency of the output signal during hazard-warning operation, because then fewer cold current surges appear in the direction indicator lamp circuit. By the dotted line between the building blocks 44 and 45 in the circuit diagram it is indicated, that here two alternatives are available. However, the control of the pulse generator 44 is preferred.

The signal of the pulse generator 46 has a different frequency and mark-to-space ratio from those of the signal of the pulse generator 40. This signal is to be switched onto the output, when a so-called lane change flasher signal is to be realised. The pulse generator 47 is included to illustrate that signals with completely predetermined pulse sequences can be used, in which the frequency and/or the mark-to-space ratio changes during this time.

The direction indicator flasher 10 further includes three voltage indicators 60, 61 and 62 which are all connected to the control input 11, to which the voltage drop at the measuring resistor 33 is conducted. One has to imagine the functioning of these building blocks in such a way that, for instance at the output of the voltage indicator 62, a signal is available when the voltage drop at the measuring resistor 33 assumes an unduly high value. The voltage indicator 62 comprises a store, so that this signal is also retained, when the relay 34 has released again. The other building blocks 61 and 60 function correspondingly, but these building blocks respond to other voltage values. Then the voltage indicator 60 supplies an output signal, when the turn-signal lamp current lies within the normal current range. The threshold value of this voltage indicator 60 is adjustable via the control input 16 of the flasher unit 10, which fact is symbolised by the variable resistor. In contrast thereto, the voltage indicator 61 responds when at least one of the direction indicator lamps is faulty. The threshold value of this voltage indicator 61 is also adjustable via the control input 15 of the flasher unit 10. The threshold values can be varied in such a way that the flasher unit can be universally used for both for tractor vehicles alone or for tractor vehicles with trailer. The threshold values can be automatically changed when the trailer is coupled.

The output signal of the voltage indicator 60 is conducted to the pulse generator 40 via a gate 53 and to the pulse generator 41 via a gate 54. The two gates are alternatively opened or closed in dependence on a control signal at the control input 17 of the flasher unit 10. This control input is connected to a light switch 63 of the vehicle. When the light switch 63 is switched on, the gate 54 is opened and the pulse generator 41 is activated, whereas the pulse generator 40 is activated by the voltage indicator 60 when the lighting system is switched off.

The outputs of the two pulse generators 40 and 46 are connected to gates 55 and 56 which are affected by a control signal at the

input 13 of the flasher unit 10. To this input 13 a control signal is applied, when the direction indicator switch is switched into its first switching position for the so-called lane change flashing. In this case, the gate 56 is opened, but the gate 55 is blocked. Upon switching-on of the direction indicator switch 30, the pulse generators 40 to 47 are brought into a condition in a way not shown in detail in which they may be activated by signals at their respective inputs. Thereby a pulse exciting the relay 34 is released in any case. When all direction indicator lamps are in order the voltage indicator 60 responds and activates the pulse generator 40, when the lighting switch 63 is switched off. If, however, the lighting system is switched on, the pulse generator 41 is activated. Thus the mark-to-space ratio of the output signal is varied at the OR-gate 52 or at the output 26 of the flasher unit 10 in dependence on the control signal at the input 17 of the flasher unit 10 which, in the present example, means that it is reduced.

If one of the direction indicator lamps is defective, the voltage indicator 60 is reset on the next switching operation of the relay 34 and the voltage indicator 61 is set instead, so that its output signal activates the pulse generator 42. In dependence on the control signal at the input 11 the frequency of the output signal is thus now changed.

If a short-circuit occurs in the direction indicator circuit, the voltage indicator 62 is set, whereas the two other voltage indicators are reset. Now the pulse generator 43 is activated and at the output 26 individual pulses may only be measured at longer time intervals. The relay 34 is energised with every pulse for a short ime, so that a new measuring operation is started. If the voltage drop at the measuring resistor 33 has changed because the short-circuit has been eliminated, one of the voltage indicators 60 or 61 responds again and the mark-to-space ratio or the frequency of the output signal changes. In this manner it is ensured that the proper flasher operation is automatically put into operation again, when the short-circuit is eliminated.

When the pulse generator 40 is activated, the pulse sequence of the output signal depends on the control signal at the input 18 too. To the control input 18 for instance is connected the brake light switch 64. The pulse generator 40 can be developed as a voltage-controlled oscillator in such a way that its frequency increases, as soon as the brake light switch 64 is actuated. To the control inputs 18 control signals depending on driving speed or acceleration can also be applied, whereby the frequency of the pulse generator 40 can be varied continuously or in several steps. The circuit arrangement could be laid out in such a way that, at a driving speed between 0 to 60 km/h, eighty turn-signal pulses per minute may be measured at the output 26 whereas, at a speed between 60 and 120 km/h, one hundred turn-signal pulses per minute and, at a speed higher than 120 km/h, one hundred and twenty or more pulses per minute are delivered. Thus from the flashing signal can be deduced the driving speed of the vehicle, so that if required it can be checked, if a vehicle exceeds the prescribed maximum speed within the boundaries of towns and villages.

When the control signal at the output 18 depends on acceleration, the circuit arrangement can be laid out in such a way that starting from a medium flashing frequency the frequency is reduced with positive acceleration and increased with negative acceleration. It would of course be also conceivable that only accelerations or only decelerations are evaluated and correspondingly only an increase or reduction of the frequency is provided.

Upon actuation of the hazard-warning signal switch 37 both direction indicator lamp circuits are controlled simultaneously. Moreover, a control signal is applied to the input 12 of the direction indicator flasher 10, so that now either the pulse generator 44 is activated with a reduced mark-to-space ratio or the pulse generator 45 with a reduced frequency. Of course it must be ensured by suitable details of circuitry, which have not been shown in detail in the drawing, that only the signal of the pulse generator 44 or 45 is switched onto the output.

The mark-to-space ratio furthermore depends on the signal at the control input 13. If the voltage indicator 60 is set, both the pulse generator 40 and the pulse generator 46 are activated. If it is only intended to overtake another vehicle and thus the direction indicator switch 30 is in its first switching position, the lane change signal of the pulse generator 46 is switched through. In the other switching position of the direction indicator switch 30 which is to indicate a driving turn in contrast thereto the signal of the pulse generator 40 is switched through.

The pulse generator 47 is activated by a control signal at the input 14 which can be released by the driver at random via the switch 65. Hereby it is illustrated that there is also a possibility that the driver can give any desired signals and thereby certain information to other road users. For instance, it could be imagined that, upon actuation of the signal through the pulse generator 47, police cars indicate to other road users driving behind them that they have to follow them.

The pulse generator 48 releases individual pulses at larger time intervals which are conducted to some or all direction indicator lamp circuits via a measuring resistor 70 and decoupling diodes 71. A voltage indicator 72

acting as a store evaluates the voltage drop at the measuring resistor 70 and energises the pilot lamp 36 when one of the test circuits is interrupted and therefore no test current flows or too low a test current. The pulse generator 48 has a blocking input which is connected to the output of the OR-gate 52, so that pulses can only be released when the relay 34 is not energised. Thus the direction indicator lamps 31 and 32 can be checked too, when the direction indicator blinker is not activated.

Of course one can also provide in well-known manner a pilot lamp flashing in accordance with the working cycle of the direction indicator lamps. A further possibility is indicated in the illustrated embodiment. The pilot lamp 35 is controlled by one of the pulse generators 49 or 50 via an OR-gate 57. The pulse generator 49 is connected to the output of the voltage indicator 62 and the pulse generator 50 to the output of the voltage indicator 61. During normal operation, the pilot lamp 35 does not flash, but, if a direction indicator lamp is defective and the voltage indicator 61 is thus activated during flasher operation, the pilot lamp 35 is controlled via the pulse generator 50. This signal of this pulse generator 50 can be developed in such a way that the mark-to-space ratio changes during that time for the sake of a better distinguishability. If a short-circuit occurs during the flasher operation, the voltage indicator 62 is activated and the pilot lamp 35 is controlled via the pulse generator 49 whose output signal differs from that of the pulse generator 50. Thus the driver has the possibility of distinguishing between different kinds of defects. Thereby it is not necessary that the output signal of the direction indicator flasher be changed too, when a filament lamp is defective. In such a case, the pulse generator could still be activated via the voltage indicator 61 and the OR-gate 59 shown in dotted lines and the gate 53, for an indication of a defective direction indicator system cannot be of much use to other road users.

In the embodiment shown in the drawing, only some of the possible variations are illustrated. Thus it is, for instance, conceivable to connect a pick-up responding to the brightness of the surrounding of the turn-signal lamps to the control input 17, so that several differing mark-to-space ratios can be adjusted in steps. But it is preferred to change the mark-to-space ratio by means of the light switch 63, because this solution is technically simple and nevertheless meets the requirements.

In order to create signals with differing mark-to-space ratio it is not necessary to provide a separate pulse generator each. It can be envisaged instead that only one pulse generator is used whereby, however, in dependence on the control signals, individual pulses or pulse sequences are faded out. Thus one could vary the circuit in such a way that, via the voltage indicator 62, a timing element is controlled which is triggered with each measuring operation of the direction indicator lamp current and then blocks the pulse generator 40 for a defined time.

In the embodiment shown the control signal at the inputs of the flasher unit 10 depends on the position of certain switches or other pick-ups. Of course, the arrangement could be extended in such a way that, at the inputs, a specific timing element follows, so that the mark-to-space ratio and/or the frequency of the output signal also depends on the time the switch is actuated. Thus it is possible in certain direction indicator systems to release a lane change flashing with a short-time operation of the direction indicator switch developed as a push-button switch, whereby this lane change flashing only lasts for a short time, and to switch on the normal direction indication with a longer operation which is only switched off again, when a switching signal depending on the steering wheel turn is released.

Finally, it is furthermore pointed out that, in the present version, the direction indicator switch 30 carries the operating current. Of course versions can be envisaged too in which two relays are switched by the direction indicator flasher, whereby each relay is assigned to a direction indicator circuit. Then the direction indicator switch can be developed as a push-button switch, whereby the turn-signal flasher will include two stores, of which each one is set, when the corresponding one of the two push-button switches is actuated and which is reset after expiration of time or by a switching signal depending on the turning of the steering wheel.

In the embodiment, all pulse generators are controlled by the central clock generator 51. This is not absolutely necessary, but if such a solution is preferred, the signal at the output of the direction indicator flasher can be used to control further functions in the motor vehicle. At the output 26, a wiper-washer pulse generator for a headlight cleaning installation of a windscreen cleaning installation on the motor vehicle can be controlled through this signal. The pulses can also be used to control the rear window heating installation, especially to switch it off. It is also possible to use a pulse of the output signal to control central locking systems in motor vehicles. But this clock generator 51 could finally also be released for the control of clocks or other time circuits, for instance also the clock signal for coding circuits for anti-theft protection of a motor vehicle. The direction indicator flasher building block could also be enlarged in such a way that it includes the complete control circuit for further functions in the motor vehicle, such as the synchronous control of several wiper motors including a protective circuit

for anti-blocking. A short-circuit protection for further consumers could be integrated therein too. Finally, a combination of electronic ignition systems with fuel-injection systems as well as with anti-blocking systems is conceivable.

It has additionally to be emphasised that, of course, the functions and solutions described here must not necessarily be all combined in one direction indicator flasher unit, but that in accordance with customers' requests a plurality of combinations will be possible. Especially if the direction indicator flasher in its initial stage should be realised by discrete components, individual functions will be preferred at first. In this connection one particularly thinks of the electronic fuse, thus the function of the pulse generator 43 and the function of the pulse generator 44 for reduction of the current capability in the direction indicator operation. Additionally, a control of the brightness will be provided.

In the near future, however, the direction indicator flasher unit 10 will no longer be realised with discrete components, but one will use integrated circuits instead. For this purpose, microprocessor and microcomputer building blocks are suitable which can be produced more and more cheaply. In case a sufficient number of pieces will be required it will also be worth-while to produce an integrated circuit according to specifications given by the customer whereby, of course, one will attempt to combine this circuit with the switching element, namely the relay, in one constructional unit. Thereby the integrated building block in a ceramic or plastic housing can be directly fastened to a relay. But one can also use semiconductor chips which are not encapsuled and directly attach them at the relay of a printed circuit board. The use of semiconductor chips mounted on a film is also conceivable.

CLAIMS

1. A flasher unit for a direction indicator system in a motor vehicle, the pulse-form output signal of which controls one of two direction indicator lamp circuits when the direction indicator switch is switched on, characterised in that the mark-to-space ratio, that is the light period of the output signal related to the cycle duration, is variable in dependence on control signals at the inputs of the flasher unit.

2. A flasher unit according to claim 1, characterised in that one control signal is dependent on the operating current in the direction indicator lamp circuit and that the mark-to-space ratio of the output signal is essentially smaller when the operating current is unduly high than when the operating current is normal.

3. A flasher unit according to claim 2, characterised in that the operating current in the direction indicator lamp circuit is tapped off via a measuring resistor, that the voltage drop at this measuring resistor is evaluated by at least one voltage indicator and that the signal at the output of one or more voltage indicators affects the mark-to-space ratio of the output signal.

4. A flasher unit according to claim 1, characterised in that a control signal depends on the brightness of the surrounding of the switched-off direction indicator lamps and the mark-to-space ratio of the output signal is reduced when the brightness of the surrounding is diminished.

5. A flasher unit according to claim 4, characterised in that the mark-to-space ratio continuously changes with the brightness of the surrounding.

6. A flasher unit according to claim 4, characterised in that the mark-to-space ratio of the output signal is reduced as soon as the brightness of the surrounding falls below a defined threshold value.

7. A flasher unit according to claim 4, characterised in that the control signal depends on the switching position of a light switch in the motor vehicle and the mark-to-space ratio of the output signal is reduced when the light switch is switched on.

8. A flasher unit according to claim 1, the output signal of which controls both direction indicator lamp circuits when the hazard-warning-signal switch is switched on, characterised in that one control signal depends on the switching position of the hazard-warning-signal switch and that the mark-to-space ratio of the output signal is reduced when the hazard-warning-signal switch is switched on.

9. A flasher unit according to claim 1, characterised in that one control signal depends on the switching position of the direction indicator switch or on the time the direction indicator switch is actuated.

10. A flasher unit according to any one of the preceding claims, characterised in that only one pulse generator is provided and that output signals with different mark-to-space ratios are created by virtue of the fact that, in dependence on the control signals, individual pulses or pulse sequences of the pulse generator are faded out.

11. A flasher unit according to any one of claims 1 to 3 and 10, characterised in that the pulse generator has a blocking input and that this blocking input is controlled by a timing element which is triggered with every measuring process of the direction indicator lamp current and then blocks the pulse generator for a defined time.

12. A flasher unit according to any one of claims 1 to 9, characterised in that the various output signals with different mark-to-space ratios are created by one pulse generator each and that, in dependence on the control signals, only one of the pulse genera-

tors may be activated at a time.

13. A flasher unit according to any one of the preceding claims, characterised in that the frequency of the output signal is variable in dependence on control signals at the inputs of the direction indicator flasher.

14. A flasher unit according to claim 13, characterised in that one control signal depends on the road speed of the vehicle and that the frequency of the output signal varies in line with the road speed.

15. A flasher unit according to claim 13, characterised in that one control signal depends on the acceleration of the vehicle and that the frequency of the output signal varies in line with the acceleration.

16. A flasher unit according to claim 13, characterised in that one control signal depends on the switching position of a switching element affected by actuating the brake of the motor vehicle and that the frequency of the output signal is increased during the braking operation.

17. A flasher unit according to claim 13, characterised in that one control signal depends on the operating current in the direction indicator lamp circuit and that the frequency of the output signal is increased when the operating current falls off to a given value, when the direction indicator system is faulty.

18. A flasher unit according to claim 13 the output signal of which controls both direction indicator lamp circuits, when the hazard-warning-signal switch is switched on, characterised in that one control signal depends on the switching position of the hazard-warning-signal switch and the frequency of the output signal is reduced when the hazard-warning-switch is switched on.

19. A flasher unit according to claim 13, characterised in that the frequency of the output signal depends on the position of the direction indicator switch or on the time during which said switch is actuated.

20. A flasher unit according to one of the claims 13 to 19, characterised in that the frequency is variable either continuously or in several steps in dependence on the control signals.

21. A flasher unit according to one of the claims 13 to 20, characterised in that the output signals with the differing frequencies are created by a voltage-controlled pulse generator to the control input of which the control signals are conducted via voltage indicators, if required.

22. A flasher unit according to any one of claims 13 to 20, characterised in that the individual output signals with differing frequencies are created via one pulse generator each and that, in dependence on the control signals, only one each of the pulse generators may be activated.

23. A flasher unit according to any one of the preceding claims, characterised in that the output signal controls a pilot lamp.

24. A flasher unit according to any one of claims 1 to 22, characterised in that for the pilot lamp a signal is created which is independent of the output signal.

25. A flasher unit according to claim 24, characterised in that the signal for controlling the pilot lamp consists of pulses or pulse sequences with mark-to-space ratios varying the time.

26. A flasher unit according to any one of the preceding claims, characterised in that via a pulse generator, at longer time intervals, a test signal is released which is conducted to the direction indicator lamps and that a store is set when a sufficient test current cannot be measured.

27. A flasher unit according to claim 26, characterised in that the test signals are separately conducted to the direction indicator lamps and a store is assigned to each direction indicator lamp.

28. A flasher unit according to claim 26, characterised in that the test signals are jointly conducted to all the direction indicator lamps and a store is set when the test current is below a given threshold value.

29. A flasher unit according to any one of the preceding claims, characterised in that output signals with given pulse sequences with varying mark-to-space ratios and/or varying frequencies can be produced via control signals to be released at random.

30. A flasher unit according to any one of the preceding claims, characterised in that the output signal controls a switching element, for instance a relay, the contact-break distance of which is looped into the turn-signal lamp circuit between the voltage source and direction indicator switch or the hazard-warning-signal switch.

31. A flasher unit according to any one of the claims 1 to 29, characterised in that in dependence on the switching position of the direction indicator switch the output signal controls one of two switching elements the contact-break distances of which are looped into the left-hand or right-hand turn-signal lamp circuit.

32. A flasher unit according to claim 30 or 31, characterised in that to each switching element a store is assigned which is set via a switching pulse of the direction indicator switch and is reset via a timing element or a switching signal released by the steering wheel turn.

33. A flasher unit according to claim 32, characterised in that the timing element may be retriggered and operates with fall-off delay.

34. A flasher unit according to any one of the preceding claims, characterised in that all pulse generators are controlled by a central clock generator the clock signal of which is conducted to an output of the direction indicator flasher unit and, if required, may also be

used for other switching operations in the motor vehicle.

35. A flasher unit according to claim 34, characterised in that other installations, for instance a wiper/washer pulse generator of a windscreen cleaning installation and/or the rear window heating and/or the central locking installation and/or a coding circuit as an anti-theft device and/or a clock are controlled via the signal of the clock generator.

36. A flasher unit according to any one of the preceding claims, characterised in that, via further inputs, the threshold values of the voltage indicators are variable and adjustable to differing lamp loads.

37. A flasher unit according to any one of the preceding claims, characterised in that it is realised by an integrated circuit or by using microprocessor or microcomputer building blocks.

38. A flasher unit according to claim 37, characterised in that the direction indicator lamp circuits are controlled via a relay and that the integrated circuit and the relay form one constructional component.

39. A flasher unit according to claim 38, characterised in that the integrated circuit is accommodated in a ceramic or plastic housing and that this housing is directly attached to the relay.

40. A flasher unit according to claim 38, characterised in that the integrated circuit is realised by a semiconductor chip which is not encapsulated or by a semiconductor chip mounted on a film and that said chip is directly attached to the relay or on a printed circuit board of the relay.

41. A flasher unit for a direction indicator system in a motor vehicle substantially as described with reference to the accompanying drawings.

CLAIMS (3 Mar 1981)

1. A flasher unit for a direction indicator system in a motor vehicle, the pulse-form output signal of which controls one of two direction indicator lamp circuits when the direction indicator switch is switched on, and in which the mark-to-space ratio, that is the light period of the output signal related to the cycle duration, is variable in dependence on control signals at the inputs of the flasher unit, characterised in that one control signal is dependent on the operating current in the direction indicator lamp circuit and that the mark-to-space ratio of the output signal is essentially smaller when the operating current is unduly high than when the operating current is normal.

2. A flasher unit according to claim 1, characterised in that the operating current in the direction indicator lamp circuit is tapped off via a measuring resistor, that the voltage drop at this measuring resistor is evaluated by at least one voltage indicator and that the signal at the output of one or more voltage indicators affects the mark-to-space ratio of the output signal.

3. A flasher unit according to claim 1, characterised in that a control signal depends on the brightness of the surrounding of the switched-off direction indicator lamps and the mark-to-space ratio of the output signal is reduced when the brightness of the surrounding is diminished.

4. A flasher unit according to claim 3, characterised in that the mark-to-space ratio continuously changes with the brightness of the surrounding.

5. A flasher unit according to claim 3, characterised in that the mark-to-space ratio of the output signal is reduced as soon as the brightness of the surrounding falls below a defined threshold value.

6. A flasher unit according to claim 3, characterised in that the control signal depends on the switching position of a light switch in the motor vehicle and the mark-to-space ratio of the output signal is reduced when the light switch is switched on.

7. A flasher unit according to claim 1, the output signal of which controls both direction indicator lamp circuits when the hazard-warning-signal switch is switched on, characterised in that one control signal depends on the switching position of the hazard-warning-signal switch and that the mark-to-space ratio of the output signal is reduced when the hazard-warning-signal switch is switched on.

8. A flasher unit according to claim 1, characterised in that one control signal depends on the switching position of the direction indicator switch or on the time the direction indicator switch is actuated.

9. A flasher unit according to any one of the preceding claims, characterised in that only one pulse generator is provided and that output signals with different mark-to-space ratios are created by virtue of the fact that, in dependence on the control signals, individual pulses or pulse sequences of the pulse generator are faded out.

10. A flasher unit according to claim 1 or 2 and 10, characterised in that the pulse generator has a blocking input and that this blocking input is controlled by a timing element which is triggered with every measuring process of the direction indicator lamp current and then blocks the pulse generator for a defined time.

11. A flasher unit according to any one of claims 1 to 8, characterised in that the various output signals with different mark-to-space ratios are created by one pulse generator each and that, in dependence on the control signals, only one of the pulse generators may be activated at a time.

12. A flasher unit according to any one of the preceding claims, characterised in that the frequency of the output signal is variable in

dependence on control signals at the inputs of the direction indicator flasher.

13. A flasher unit according to claim 12, characterised in that one control signal depends on the road speed of the vehicle and that the frequency of the output signal varies in line with the road speed.

14. A flasher unit according to claim 12, characterised in that one control signal depends on the acceleration of the vehicle and that the frequency of the output signal varies in line with the acceleration.

15. A flasher unit according to claim 12, characterised in that one control signal depends on the switching position of a switching element affected by actuating the brake of the motor vehicle and that the frequency of the output signal is increased during the braking operation.

16. A flasher unit according to claim 12, characterised in that one control signal depends on the operating current in the direction indicator lamp circuit and that the frequency of the output signal is increased when the operating current falls off to a given value, when the direction indicator system is faulty.

17. A flasher unit according to claim 12 the output signal of which controls both direction indicator lamp circuits, when the hazard-warning-signal switch is switched on, characterised in that one control signal depends on the switching position of the hazard-warning-signal switch and the frequency of the output signal is reduced when the hazard-warning-switch is switched on.

18. A flasher unit according to claim 12, characterised in that the frequency of the output signal depends on the position of the direction indicator switch or on the time during which said switch is actuated.

19. A flasher unit according to one of the claims 12 to 18, characterised in that the frequency is variable either continuously or in several steps in dependence on the control signals.

20. A flasher unit according to one of the claims 12 to 19, characterised in that the output signals with the differing frequencies are created by a voltage-controlled pulse generator to the control input of which the control signals are conducted via voltage indicators, if required.

21. A flasher unit according to any one of claims 12 to 19, characterised in that the individual output signals with differing frequencies are created via one pulse generator each and that, in dependence on the control signals, only one each of the pulse generators may be activated.

22. A flasher unit according to any one of the preceding claims, characterised in that the output signal controls a pilot lamp.

23. A flasher unit according to any one of claims 1 to 21, characterised in that for the pilot lamp a signal is created which is independent of the output signal.

24. A flasher unit according to claim 23, characterised in that the signal for controlling the pilot lamp consists of pulses or pulse sequences with mark-to-space ratios varying the time.

25. A flasher unit according to any one of the preceding claims, characterised in that via a pulse generator, at long time intervals, a test signal is released which is conducted to the direction indicator lamps and that a store is set when a sufficient test current cannot be measured.

26. A flasher unit according to claim 25, characterised in that the test signals are separately conducted to the direction indicator lamps and a store is assigned to each direction indicator lamp.

27. A flasher unit according to claim 25, characterised in that the test signals are jointly conducted to all the direction indicator lamps and a store is set when the test current is below a given threshold value.

28. A flasher unit according to any one of the preceding claims, characterised in that output signals with given pulse sequences with varying mark-to-space ratios and/or varying frequencies can be produced via control signals to be released at random.

29. A flasher unit according to any one of the preceding claims, characterised in that the output signal controls a switching element, for instance a relay, the contact-break distance of which is looped into the turn-signal lamp circuit between the voltage source and direction indicator switch or the hazard-warning-signal switch.

30. A flasher unit according to any one of claims 1 to 28, characterised in that in dependence on the switching position of the direction indicator switch the output signal controls one of two switching elements the contact-break distances of which are looped into the left-hand or right-hand turn-signal lamp circuit.

31. A flasher unit according to claim 29 or 30, characterised in that to each switching element a store is assigned which is set via a switching pulse of the direction indicator switch and is reset via a timing element or a switching signal released by the steering wheel turn.

32. A flasher unit according to claim 31, characterised in that the timing element may be retriggered and operates with fall-off delay.

33. A flasher unit according to any one of the preceding claims, characterised in that all pulse generators are controlled by a central clock generator the clock signal of which is conducted to an output of the direction indicator flasher unit and, if required, may also be used for other switching operations in the motor vehicle.

34. A flasher unit according to claim 33, characterised in that other installations, for

instance a wiper/washer pulse generator of a windscreen cleaning installation and/or the rear window heating and/or the central locking installation and/or a coding circuit as an anti-theft device and/or a clock are controlled via the signal of the clock generator.

35. A flasher unit according to any one of the preceding claims, characterised in that, via further inputs, the threshold values of the voltage indicators are variable and adjustable to differing lamp loads.

36. A flasher unit according to any one of the preceding claims, characterised in that it is realised by an integrated circuit or by using microprocessor or microcomputer building blocks.

37. A flasher unit according to claim 36, characterised in that the direction indicator lamp circuits are controlled via a relay and that the integrated circuit and the relay form one constructional component.

38. A flasher unit according to claim 37, characterised in that the integrated circuit is accommodated in a ceramic or plastic housing and that this housing is directly attached to the relay.

39. A flasher unit according to claim 37, characterised in that the integrated circuit is realised by a semiconductor chip which is not encapsulated or by a semiconductor chip mounted on a film and that said chip is directly attached to the relay or on a printed circuit board of the relay.

40. A flasher unit for a direction indicator system in a motor vehicle substantially as described with reference to the accompanying drawings.

Printed for Her Majesty's Stationery Office
by Burgess & Son (Abingdon) Ltd.—1981.
Published at The Patent Office, 25 Southampton Buildings,
London, WC2A 1AY, from which copies may be obtained.