Title: ELECTROMOTIVE WINDSCREEN WIPER DRIVE

Abstract: Electromotive windscreen wiper drive for vehicles, with a shaft (1) driven when the drive is switched on and with at least one sensor arrangement for generation of signals for activation of dispensing of a washing and cleaning fluid precisely at the wiping angle onto a vehicle screen respectively when the shaft has reached at least one first angular position (WP1, WP2) and/or for termination of dispensing of the washing and cleaning fluid in at least a second angular position (WP9, WPB1), whereby the sensor arrangement, which presents at least one sensor element (6, 7) interacting with a magnetic field of at least one permanent magnet (4), with a rotating shaft and with a thereby induced relative movement between the at least one permanent magnet and the at least one sensor element, issues phase-displaced or time-displaced output signals (AS6, AS7).
Description

Electromotive windscreen wiper drive

[0001] The invention concerns an electromotive windscreen wiper drive according to patent claim 1.

[0002] Windscreen wiper drives for vehicles are known in various embodiments. It is also known in particular in this case to design such drives with at least one sensor and control unit, namely for emission precisely at the wiping angle of a washing and cleaning fluid from spray jets onto the vehicle screen involved when the windscreen wiper drive is activated and when the windscreen washing module is activated in such a manner that in at least one of the two subphases of the to-and-fro pivoting movement of the wiper arms of a windscreen wiper module, emission of the washing and cleaning fluid is respectively activated at a predetermined angular position of the pivoting movement and is terminated at a likewise predetermined angular position, to be more precise, before the wiper arm reaches an end or turning position of the pivoting movement and the next subphase of the pivoting movement is initiated. Only in this manner is it also possible to achieve an optimum cleaning effect with optimum use of the washing and cleaning fluid.

[0003] The purpose of the invention is to demonstrate an electromotive windscreen wiper drive which, with a simplified structural design, allows very accurate emission of the washing and cleaning fluid precisely at the wiping angle even with changing speeds of the electromotive windscreen wiper drive and therefore the pivoting movement of the wiper arms of a windscreen wiper module.

[0004] In order to solve this problem, an electromotive windscreen wiper drive according to claim 1 is developed.

[0005] In the electromotive windscreen wiper drive according to the invention, the functional elements involve at least one sensor arrangement, which together with control electronics, governs emission of the washing and cleaning fluid precisely at the wiping angle and at least one permanent magnet, in addition to at least two sensor elements responding to the magnetic field of the permanent magnet. The at least one permanent
magnet in addition to the at least two sensor elements are arranged in this case in such a manner that on rotating movement of the shaft of the windscreen wiper drive or wiper motor, a relative movement between the permanent magnet and the sensor element occurs, i.e. the permanent magnet moved simultaneously with the shaft travels past the immovably arranged sensor elements. Whenever the permanent magnet is located in the area of a sensor element, i.e. the revolving shaft has reached a rotational position or angular position corresponding to or assigned to the position of this sensor element, the sensor element in question delivers or induces an electrical output signal and/or a change in the level of such an output signal. Taking account of the time interval between two sequential recurrent events in the respective output signal and also taking account of the time interval between a recurrent event in the output signal of a sensor element and a corresponding recurrent event in the output signal of the other sensor element, the control device determines the times at which, with reference to a predetermined rotational position of the shaft of the drive, dispensing of the washing and cleaning fluid precisely at the wiping angle must be initiated and terminated respectively and determines the duration of dispensing of the cleaning and washing fluid in order to ensure dispensing precisely at the wiping angle. The control device provides for this purpose at least one corresponding control signal for control of dispensing of the washing and cleaning fluid.

[0006] Events of the same type involve for example in the sense of the invention the forward edges of pulses of the pulse-like sensor signals or the rearward edges of these pulses and the moments of the forward or rearward edges. Events of the same type also respectively involve for example in the sense of the invention the output signals exceeding the threshold value predetermined and established in the control or analysis electronics and the moments at which it is exceeded or however the output signals falling below the predetermined threshold value and the moments at which the values fall below the latter.

[0007] An electromotive windscreen wiper drive according to the invention therefore comprises an electric windscreen wiper motor and as a further
functional element, a sensor arrangement including control electronics for generation of signals for dispensing of washing fluid according to the wiping angle. The other functional elements may be provided outside the windscreen wiper motor. It is preferred however for these other functional elements to be incorporated in the windscreen wiper motor including the latter's transmission section; in this case, the electromotive windscreen wiper drive according to the invention is actually only a windscreen wiper motor.

[0008] Further developments, advantages and application possibilities of the invention are also apparent from the following description of examples of embodiment and from the figures. In this case, all the characteristics described and/or illustrated are in themselves or in any desired combination fundamentally a subject of the invention, regardless of their summary in the claims or their backward relation. The contents of the claims are also made an integral part of the description.

[0009] The invention is described below in further detail in examples of embodiment based on the figures.

[0010] Fig. 1 shows a very simplified presentation of an electromotive windscreen wiper drive (wiper motor) of a windscreen wiper module otherwise not illustrated for vehicles, together with a sensor and control unit for controlled emission of a washing and cleaning fluid precisely at the wiping angle onto a vehicle screen;

[0011] Fig. 2 shows a diagram of the chronological sequence of the electrical output signals of the sensor unit, together with the signals controlling a supply unit;

[0012] Fig. 3 shows a diagram of the chronological sequence of the electrical output signals of the sensor unit, together with the signals controlling a supply unit in a further embodiment of the invention.

[0013] In the figures, 1 is the output shaft of an electromotive windscreen wiper drive or wiper motor 2 (geared motor) designed for rotary running of an otherwise not further illustrated windscreen wiper module for vehicles. A crank 3 is attached to the output shaft 1 which (crank), is continuously driven in rotary motion with the output shaft 1 in the direction of the arrow.
R when the wiper motor 2 is switched on or the windscreen wiper module is activated.

[0014] The wiper arm of the windscreen wiper module is pivoted in the familiar fashion with the rotating crank 3 by means of a linkage and to be more precise between a first turning position of the wiper arm pivoting movement, which (turning position) corresponds to the angular position WP₁ of the output shaft 1 and a second turning position of the wiper arm pivoting movement, which (turning position) corresponds to the angular position WP₂ of the output shaft 1.

[0015] In order to detect the angular positions of the output shaft 1, a permanent magnet 4 is arranged on the latter or on a wheel connected to the output shaft 1, e.g. a pinion of the wiper motor 2, which (magnet) forms an air gap or magnetic gap and pole transition 5 with a very precisely defined and oriented magnetic field between an N pole and S pole and interacts with two Hall sensors 6 and 7 which do not rotate with the output shaft 1.

[0016] The two Hall sensors 6 and 7, which form a sensor arrangement with the permanent magnet 4, are arranged offset in the direction of rotation R of the output shaft 1 around the axis of this shaft in relation to one another by a degree of angle on a housing section of the wiper motor 2, on a housing cover made of plastic for example, or on a printed circuit board fixed in the housing cover for example and to be more precise in such a way that each Hall sensor 6 and 7, when the pole transition 5 oriented radially to the axis of the output shaft 1 in the embodiment presented travels past, issues an output signal AS6 (Hall sensor 6) and AS7 (Hall sensor 7) and namely according to figure 2 in the form of a sequence of negative voltage pulses IP6 (Hall sensor 6) and IP7 (Hall sensor 7). The time interval between the forward and rearward edge of the pulses IP6 and therefore the pulse width of these pulses is denoted by \( t_1 \). The time interval between the forward and rearward edge of the pulses IP7 and therefore the pulse width of these pulses is denoted by \( t_2 \). Furthermore, the pulses IP7 are phase-displaced and time-displaced in relation to the pulses IP6 and indeed according to the angular interval presented by the Hall sensors 6 and 7 in relation to one another with reference to the rotating movement of
the output shaft 1.

[0017] In the embodiment presented, the Hall sensor 6 is arranged such that the forward edge of the pulse IP coincides with the rotational position or angular position WP1 of the output shaft 1 corresponding to the first end or turning position of the pivoting movement of the wiper arm. The Hall sensor 7 is arranged such that the forward edge of the pulses IP7 generated by this sensor coincides with a rotational position or angular position WP2 corresponding to the second turning position of the pivoting movement of the wiper arm, i.e. with symmetrical functioning of the crank drive, both Hall sensors 6 and 7 are arranged offset in relation to one another by a degree of angle of 180° or approx. 180° around the axis of the output shaft 1.

[0018] Both Hall sensors 6 and 7 interact with control electronics 8 consisting for example of a microprocessor, which among other aspects control a supply unit 9 or a pump 9.1 at this position of a windscreen washing module for supply of the washing and cleaning fluid (water with cleaning and antifreeze additives, if appropriate) to be emitted via spray jets of jet groups A and B, namely with the windscreen wiper module and windscreen washing module switched on during wiping operation depending on the direction of movement and pivoting position of the wiper arms. Control during emission of the washing and cleaning fluid is performed in detail such that the washing and cleaning fluid is emitted during the pivoting movement of the wiper arms in one direction and therefore within a first subphase of a complete revolution of the shaft 1 by the spray jets of jet group A provided on the wiper arms or wiper blades and during pivoting of the wiper arms in the opposite direction and therefore within a second subphase of a complete revolution of the shaft 1 by the spray jets of jet group B provided on the wiper arms and/or wiper blades and to be more precise, running ahead of the corresponding wiper blade in the wiper arm movement respectively. This controlled emission of the washing and cleaning fluid proceeds automatically with the windscreen wiper module switched on and the windscreen washing module activated.

[0019] In order to achieve best possible use of the cleaning and washing fluid in
addition to optimum cleaning of the vehicle screen, it is also necessary that emission of the washing and cleaning fluid be delayed in each subphase of the pivoting movement of the wiper arms, i.e. initiated at an angular position of the wiper arms and at a moment at which the wiper arms have already travelled out of the turning position constituting the beginning of this subphase. Furthermore, it is also necessary that emission of the cleaning and washing fluid be completed before the wiper arms reach the next turning position in the pivoting movement.

[0020] Emission of the washing and cleaning fluid is time controlled by the pulse-like control signals and the control pulses S1 and S2. During the period \( t_{\text{WashA}} \) of each negative pulse S1, the washing and cleaning fluid is emitted by the spray jets of group A within a subphase of the pivoting movement of the wiper arms which (subphase) corresponds to a rotation of the shaft 1 between the angular positions WP1 and WP2, i.e. through 180°. During the period \( t_{\text{WashB}} \) of each negative pulse S2, the washing and cleaning fluid is emitted by the spray jets of jet group B, namely during the other subphase of the pivoting movement of the wiper arms, which (subphase) corresponds to a rotation of the shaft 1 between the angular position WP2 and the angular position WP1, i.e. once again through 180°.

[0021] As illustrated in figure 2, in the first subphase respectively of the pivoting movement of the wiper arms and each full revolution of the shaft 1, i.e. during the period \( t_{\text{W}} \), emission of the cleaning and washing fluid is initiated from the spray jets of jet group A respectively in relation to the forward edge of the pulses IP with a time delay of \( t_{A1} \) and in relation to the rearward edge of the pulses IP6 with a time delay of \( t_{A2} \) at the angular position WP\(_{A1}\) and is ended with a time interval \( t_{A9} \) before the forward edge of the next pulse IP7 at an angular position WP\(_{A9}\). Analogously, in each second subphase of each pivoting movement of the wiper arms and each full revolution of the shaft 1, i.e. during the period \( t_{\text{W}} \), emission of the cleaning and washing fluid is initiated from the spray jets of jet group B in relation to the forward edge of the pulses IP7 with a time delay of \( t_{B1} \) and in relation to the rearward edge of the pulses IP7 at the angular position WP\(_{B1}\) with a time delay of \( t_{B2} \) and is ended with a time interval \( t_{B9} \) before
the next pulse IP6 arrives at an angular position WP99. The angular
positions WP11, WP15, and WP99, WP99 are respectively presented as time
intervals in relation to a reference angular position (e.g. WP1).

Control is preferably performed in this case such that the times tA1, tA2, tA9,
tB1, tB2, tB9, tWashA and tWashB taking account among other aspects of the
current pulse widths and the current time intervals t1 and t2 and taking
account of the respective times t1W and tOw of the two subphases of the
pivoting movement, are determined.

The advantage of this type of control is that even in case of changes in the
rotation speed of the shaft 1, which may be due to various different
parameters, emission of the washing and cleaning fluid precisely at the
wiping angle and therefore optimum cleaning of the vehicle screen and
optimum use of the washing and cleaning fluid are guaranteed and indeed
with a simplified design of the sensor arrangement requiring only two Hall
sensors 6 and 7 and only one permanent magnet 4, in addition to with a
simplified time control of the supply unit 9 and the pump 9.1 at this
position.

Changes in the rotation speed of the output shaft 1, owing for example to
the road speed of the vehicle and increase or reduction in the wiping rate
by the vehicle user, but also owing to changing loads on the wiper motor 2,
e.g. as a result of changes in the condition of the vehicle screen, also
result in changes in the pulse widths and the time intervals t1 and t2 in
addition to the times of subphases t1W and tOw. Since the angles of rotation
of the shaft 1 corresponding to the times t1W and tOw, but also the angles of
rotation of the shaft 1 corresponding to the pulse widths and time intervals
t1, t2 and/or the relationship of the times tA1, tA2, tA9, tB1, tB2, tB9, tWashA and t
washB to the pulse widths and time intervals t1, t2 and to the times t1W, tOw
are known, the times tA1, tA2, tA9, tB1, tB2, tB9 for the beginning and end of
the pulses S1 and S2 and for the beginning and end of dispensing of the
washing and cleaning fluid can be readily determined by the control
electronics 8 even in case of changes in the rotation speed of the output
shaft 1 and the corresponding control signals S1 and S2 can be issued.

It was assumed above that the sensor elements or Hall sensors 6 and 7
interacting with the permanent magnetic 4 respond to the phase transition between the N pole and S pole of the permanent magnet and therefore respectively issue a pulse-like output signal AS6 and AS7 and a pulse-like voltage, with the moment of the forward and/or rearward edge being the recurrent events that serve for determination of the angular positions WP_A1, WP_B1 for activation of dispensing of the washing and cleaning fluid and the angular position WP_A9, WP_B9 for termination of dispensing of the washing and cleaning fluid.

[0026] As illustrated in figure 3, it is also possible to use sensor elements responding to the magnetic field of the permanent magnet 4, for example Hall sensors 6 and 7 (also analog Hall sensors), that respectively issue an output signal AS6 (output signal of sensor 6) and AS7 (output signal of sensor 7) which changes depending on the rotational position of the output shaft and to be more precise, in the form of a voltage that changes in level, e.g. without any particularly steep forward and rearward edge.

[0027] In order to determine the angular positions WP_A1, WP_B1 and WP_A9, WP_B9 and the corresponding times t_A1, t_B1, t_A9, t_B9, t_WashA and t_WashB, whenever for example in the control electronics 8 the output signal AS6 or AS7 of the respective sensor 6 or 7 exceeds and/or falls below a predetermined level or threshold value, the moment in time T_61, T_62 and T_71 and T_72 is assessed as the decisive event for determination of the angular positions WP_A1, WP_B1 and WP_A9, WP_B9 and the corresponding time t_A1, t_A2, t_A9, t_B1, t_B2, t_B9, t_WashA and t_WashB, so that taking account of the spatial angular interval of the two Hall sensors 6 and 7 in relation to one another, taking account of the phase displacement between the output signals AS6 and AS7 and of the time interval t_W and t_W due to this phase displacement between the recurrent events corresponding to one another in the output signals, that is to say, between the events T_61 and T_71 (time interval t_W) and the events T_71 and T_61 (time interval t_W) and/or taking account of the time interval t_2 between the events T_61 and T_62 in addition to the time interval t_2 between the sequential events T_71 and T_72, the angular positions WP_A1, WP_B1 and WP_A9, WP_B9 for activation and for termination of emission of the washing and cleaning fluid and the
corresponding times \( t_{A1}, t_{A2}, t_{A9}, t_{B1}, t_{B2}, t_{B9}, t_{\text{WashA}} \) and \( t_{\text{WashB}} \) can be determined and the pulses \( S_1 \) and \( S_2 \) for control of emission of the washing and cleaning fluid precisely at the wiping angle can be generated.

[0028] It is also possible in this case in particular to form an internal control signal presenting the pulses \( IP6' \) and \( IP7' \) respectively in the control electronics 8 by monitoring the level of the output signals AS6 and AS7. The forward edge of the pulses \( IP6' \) is generated respectively in this case when the level of the output signal AS6 of the sensor element 6 exceeds the predetermined threshold value \( SW \), i.e. at the moment \( T_{61} \). The rearward edge of the impulses \( IP6' \) is generated when the level of the output signal AS6 falls below the predetermined threshold value \( SW \), i.e. at the moment \( T_{62} \). Analogously, the forward edge of the pulses \( IP7' \) is generated respectively when the level of the output signal AS7 of the sensor element 7 exceeds the predetermined threshold value \( SW \), i.e. at the moment \( T_{71} \). The rearward edge of the pulses \( IP7' \) is subsequently generated when the level of the output signal AS7 falls below the predetermined threshold value \( SW \), i.e. at the moment \( T_{72} \).

[0029] The internal pulse signals \( IP6' \) and \( IP7' \) received in this manner are then processed in the manner described above in connection with figure 2 according to the pulse signals \( IP6 \) and \( IP7 \), namely once again for determination of the angular positions \( WP_{A1}, WP_{B1} \) and \( WP_{A9}, WP_{B9} \) and the corresponding times \( t_{A1}, t_{A2}, t_{A9}, t_{B1}, t_{B2}, t_{B9}, t_{\text{WashA}} \) and \( t_{\text{WashB}} \) and for formation of the control signals \( S_1 \) and \( S_2 \).

[0030] It is also possible furthermore to design the sensor elements 6 and 7 as threshold value sensors, which respectively issue for example a pulse-like output signal AS6 and AS7 with the pulses \( IP6 \) and \( IP7 \), the forward edge of which is once again generated when the magnetic field changing with the rotating movement of the output shaft 1 in the magnetic force on the sensor element 6 and 7 or a primary electrical signal derived from the magnetic field exceeds or falls below a predetermined threshold value and the rear edge of which is generated when the magnetic field changing with the rotating movement of the output shaft 1 in the magnetic force on the sensor element 6 and 7 or a primary electrical signal derived from the
magnetic field exceeds or falls below a predetermined threshold value. The output signals AS6 and AS7 of threshold value sensors of this type correspond in this case to the pulse-like output signals in figure 2 and are used in the manner described at that point for determination of the angular positions WP_{A1}, WP_{B1} and WP_{A9}, WP_{B9} and the corresponding times t_{A1}, t_{B1}, t_{A9}, t_{B9}, t_{washA} and t_{washB}.

[0031] The invention is described above based on an example of embodiment. It is understood that modifications and variations are possible without departing as a result from the concept on which the invention is based. It was therefore assumed above that the sensor elements interacting with the permanent magnet 4 are Hall sensors. Other sensors or sensor elements responding to the magnetic field may also be used in the same manner.

[0032] It was assumed above that the Hall sensors 6 and 7 in addition to the permanent magnet are arranged in such a way that the pulses IP6 and IP7 and their forward edges or the events T_{61} and T_{71} corresponding to these forward edges coincide with the angular positions WP_{1} and WP_{2} corresponding to the turning positions of the output shaft. Any other arrangement of the angular positions WP_{1} and WP_{2} in relation to the rotational position of the output shaft 1 is also possible of course. In these cases also, the angular positions and the corresponding times, taking account of the spatially defined arrangement of the Hall sensors 6 and 7 and the likewise defined arrangement of the permanent magnet in relation to the output shaft 1, taking account of the phase displacement and the time intervals resulting from the phase displacement between recurrent events of the same type in the output signals of the Hall sensors 6 and 7 or other sensor elements and/or taking account of the time interval of two sequential events in one and the same output signal can be determined and the corresponding control signals S1 and S2 can be generated.

[0033] It was assumed above that the sensor elements interacting with the permanent magnet 4 are Hall sensors. Other sensors or sensor elements responding to a magnetic field may be used in the same manner.

[0034] It was assumed above that the sensor arrangement consists of at least
two sensor elements 6 and 7 and of a permanent magnet 4 with a pole transition 5. It is also fundamentally possible to provide for a permanent magnet arrangement formed of at least one permanent magnet which presents at least two pole transitions, also with a polar field pattern for example and/or generates a magnetic field, which has at least two areas of different magnetic polarity and/or magnetic force interacting with the sensor elements 6 and 7. In this embodiment, it is also subsequently possible to dispense with the sensor element 7 for example and determine the angular positions \( WP_{A1} \), \( WP_{B1} \) and \( WP_{A9} \), \( WP_{B9} \) and the corresponding times \( t_{A1} \), \( t_{A2} \), \( t_{A9} \), \( t_{B1} \), \( t_{B2} \), \( t_{B9} \), \( t_{WashA} \) and \( t_{WashB} \) taking account of the time/angular interval between the at least two pole transitions and/or the at least two areas of different magnetic polarity and/or magnetic strength, for example by detection of the ascending and descending edges or by detecting when a value exceeds or falls below a threshold value of the output signal. Furthermore, it is also possible to make provision for additional sensor elements in order to determine further time-angle dependencies.
Claims

1. Electromotive windscreen wiper drive for vehicles, with a shaft (1) driven when the drive is switched on and with at least one sensor arrangement for generation of signals for activation of dispensing of a washing and cleaning fluid precisely at the wiping angle onto a vehicle screen respectively when the shaft (1) has reached at least one first angular position (WPA1, WPB1) and/or for termination of dispensing of the washing and cleaning fluid in at least a second angular position (WPA9, WPB9), characterised in that,
   - the sensor arrangement presents at least one sensor element (6,7) interacting with a magnetic field of at least one permanent magnet (4),
   - the sensor arrangement with a rotating shaft (1) and with a thereby induced relative movement between the at least one permanent magnet (4) and the at least one sensor element (6, 7) delivers phase-displaced or time-displaced output signals (AS6, AS7), and
   - a control device (8) interacting with the sensor elements (6, 7) is provided, whereby the control device (8) taking account of the phase displacement between the output signals (AS6, AS7) or of a time interval (t\text{W}, t\text{OW}) due to the phase displacement between two chronologically sequential events (IP6, IP7; T6.1, T7.1) in different output signals (AS6, AS7) and/or taking account of the time interval (t1, t2) between two chronologically sequential events in at least one output signal (AS6, AS7) determines the at least one first angular position (WPA1, WPB1) for activation of dispensing of the washing and cleaning fluid in addition to the at least one second angular position (WPA9, WPB9) for deactivation of dispensing of the washing and cleaning fluid and to be more precise for provision of at least one output signal (S1, S2) controlling dispensing according to the wiping angle of the washing and cleaning fluid.

2. Windscreen wiper drive according to claim 1, characterised in that the sensor arrangement presents at least two sensor elements (6, 7).
3. Windscreen wiper drive according to claim 1 or 2, characterised in that the sensor arrangement presents at least one permanent magnet (4), the magnetic field of which, at least in its part interacting with the at least one sensor element (6, 7) presents at least two areas of different magnetic polarity and/or magnetic force and/or at least one area with a magnetic force changing at least once.

4. Windscreen wiper drive according to one of the above claims, characterised in that the sensor arrangement presents at least one permanent magnet (4) that forms at least one pole transition.

5. Windscreen wiper drive according to one of the above claims, characterised in that the control device (8) establishes angular positions (WP₁, WP₂, WP₃, WP₄) for activation and termination of dispensing of the washing and cleaning fluid taking account of a spatial angular interval (α) between the at least two sensor elements (6, 7) and/or the at least two areas of different magnetic polarity and/or magnetic force and/or between at least two pole transitions.

6. Windscreen wiper drive according to claim 5, characterised in that the control device (8) for establishment of the angular interval (α) between the at least two sensor elements (6, 7) and/or between the at least two areas of different magnetic polarity and/or magnetic force and/or between the at least two pole transitions is formed of the time interval (t₁, t₂) of the recurrent events (IP₆, IP₇; T₆, T₇) of the at least two output signals (AS₆, AS₇) of the sensor elements (6, 7) and taking account of a cycle period (T_cyc) which corresponds to the cycle duration or the time interval of two sequential events (IP₆, IP₇; T₆, T₇) in the output signal (AS₆, AS₇) of one and the same sensor element (6, 7) or a multiple thereof.

7. Windscreen wiper drive according to one of the above claims, characterised in that the at least one sensor arrangement in addition to the control device (8) for provision of at least one of the control signals (S₁, S₂) controlling
dispensing of the washing and cleaning fluid precisely at the wiping angle is
designed within at least one subphase of a full revolution of the shaft (1).  

8. Windscreen wiper drive according to one of the above claims, characterised in
that the at least one sensor arrangement in addition to the control device (8) for
provision of at least one of the control signals (S1, S2) controlling
dispensing of the washing and cleaning fluid precisely at the wiping angle is
designed within two subphases respectively of a full revolution of the shaft (1),
whereby the chronologically sequential subphases preferably correspond in
total to a full revolution of the shaft (1).

9. Windscreen wiper according to one of the above claims, characterised in that
the at least one sensor device is designed such that at least first recurrent
events (IP$_1$, IP$_2$; T$_{6,1}$, T$_{7,1}$) of at least one output signal (AS6, AS7) coincide
with a subphase of the rotating movement of the shaft (1), for example with the
beginning or end of the at least one subphase of the rotating movement of the
shaft (1), within which (subphase of the rotating movement) the control
electronics generate or supply the at least one control signal (S1, S2).

10. Windscreen wiper drive according to one of the above claims, characterised in
that the at least one sensor arrangement is designed such that recurrent
events (IP$_6$, IP$_7$; T$_{6,1}$, T$_{7,1}$) of the at least two output signals (AS6, AS7)
coincide respectively with a subphase of the rotating movement of the shaft
(1), for example with the beginning or end of one of each subphase of the full
revolution of the shaft (1).

11. Windscreen wiper drive according to one of the above claims, characterised in
that the output signal (AS6, AS7) of at least one sensor element (6, 7) is a
pulse-like signal with pulses (IP$_6$, IP$_7$) and that the recurrent events are these
pulses or their forward and/or rearward edges.

12. Electromotive auxiliary drive according to claim 11, characterised in that the at
least one sensor arrangement is designed such that the pulses (IP$_1$, IP$_2$) of at
least one pulse sequence coincide with their forward or rearward edges with at least one subphase of the rotating movement of the shaft (1), for example with the end or the beginning of at least one subphase of a full revolution of the shaft (1).

13. Windscreen wiper drive according to one of the above claims, characterised in that the output signal (AS6, AS7) of at least one sensor element (6, 7) is a signal changing in level and that the recurrent event in the output signal (AS6, AS7) of at least one sensor (6, 7) is present when the level of the output signal exceeds or falls below a predetermined threshold value (SW).

14. Windscreen wiper drive according to claim 13, characterised in that the at least one sensor arrangement is designed such that exceeding or falling below the threshold value (SW) coincides with at least one subphase of the rotating movement of the shaft (1), for example with the end or the beginning of at least one subphase of a full revolution of the shaft.

15. Windscreen wiper drive according to one of the above claims, characterised in that the at least two sensor elements (6, 7) and/or the at least two areas of different magnetic polarity and/or magnetic force and/or the at least two pole transitions and/or the sensor elements (6, 7) are provided offset in relation to one another by approximately 180° around the axis of the shaft (1).

16. Windscreen wiper drive according to one of the above claims, characterised in that the beginning and the end of the respective subphase of the full revolution of the shaft (1) correspond to the end or turning positions of a pivoting movement of wiper arms of a windscreen wiper module driven (arms) by the windscreen wiper drive (2).

17. Windscreen wiper drive according to one of the above claims, characterised in that the control device (8) is designed for provision of respectively different control signals (S1, S2) in the different subphases of the rotating movement of the shaft (1) and namely for emission of the cleaning and washing fluid at
different spray jets or jet groups (A, B) in the subphases of full revolution of the shaft (1) and depending on the direction of the pivoting movement of the wiper arms of a windscreen wiper module driven (arms) by the windscreen wiper drive (2).

18. Windscreen wiper drive according to one of the above claims, characterised by its design for rotary running with a shaft (1) driven in rotary motion in one direction of rotation (R) when the drive is switched on.

19. Windscreen wiper drive according to one of the above claims, characterised in that the shaft is the output shaft (1) of the drive equipped with a crank (3) for example.

20. Windscreen wiper drive according to one of the above claims, characterised in that the sensor arrangement supplies at least two output signals (AS6, AS7).

21. Windscreen wiper drive according to claim 20, characterised in that the sensor arrangement for establishment of several time-angle dependencies presents more than two sensor elements (6, 7) and/or issues more than two output signals (AS6, AS7).

22. Windscreen wiper drive according to one of the above claims, characterised in that the at least one sensor element is a Hall sensor (6, 7).
A. CLASSIFICATION OF SUBJECT MATTER

INV. B60S1/08 B60S1/48

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B60S

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO=Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
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<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No</th>
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<tr>
<td>X</td>
<td>EP 0 764 568 A (FUJII MITSUO [JP]) 26 March 1997 (1997-03-26) column 13, lines 11-47; figure 7</td>
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Further documents are listed in the continuation of Box C

| See patent family annex |

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Name and mailing address of the ISA/Authorized officer

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