Sept. 9, 1969 E. KOLB 3,465,378

WINDSHIELD CLEANER

Filed Dec. 8, 1967 4 Sheets-Sheet 1

FIG. 1

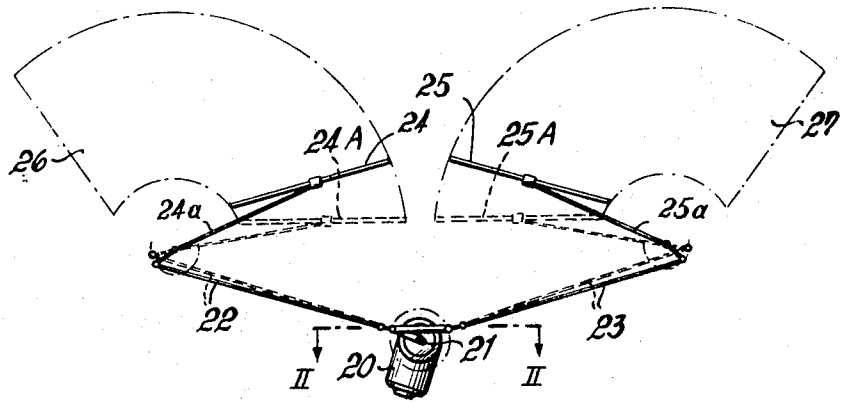
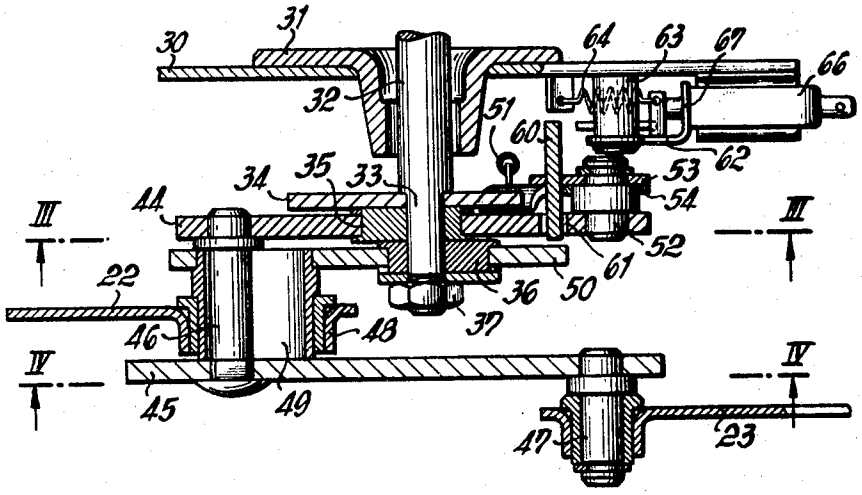


FIG. 2



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WINDSHIELD CLEANER

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FIG. 3

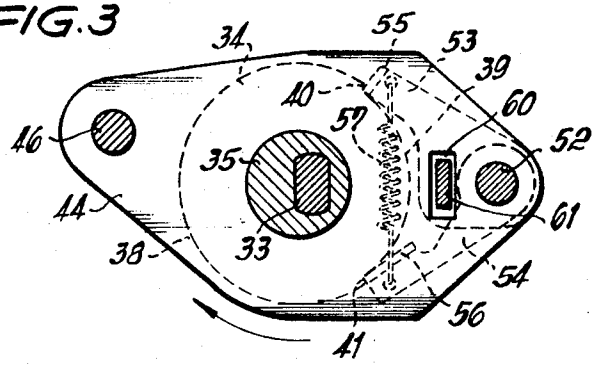


FIG. 4

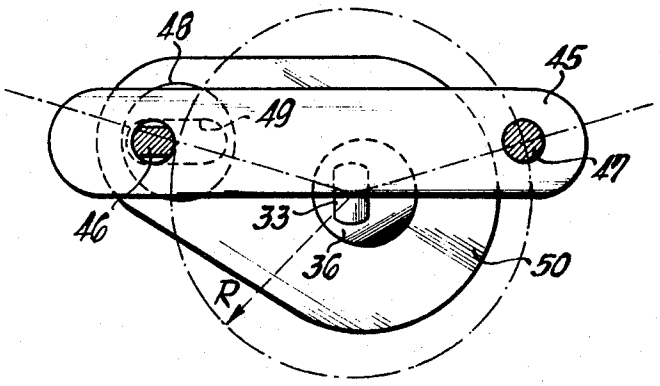
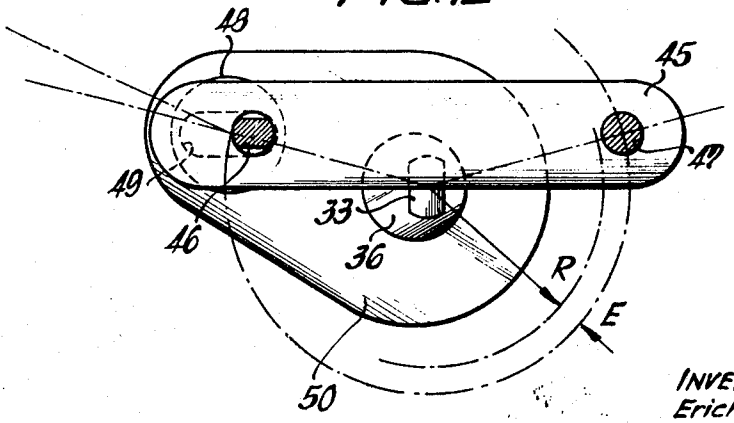


FIG. 12



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WINDSHIELD CLEANER

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FIG. 5

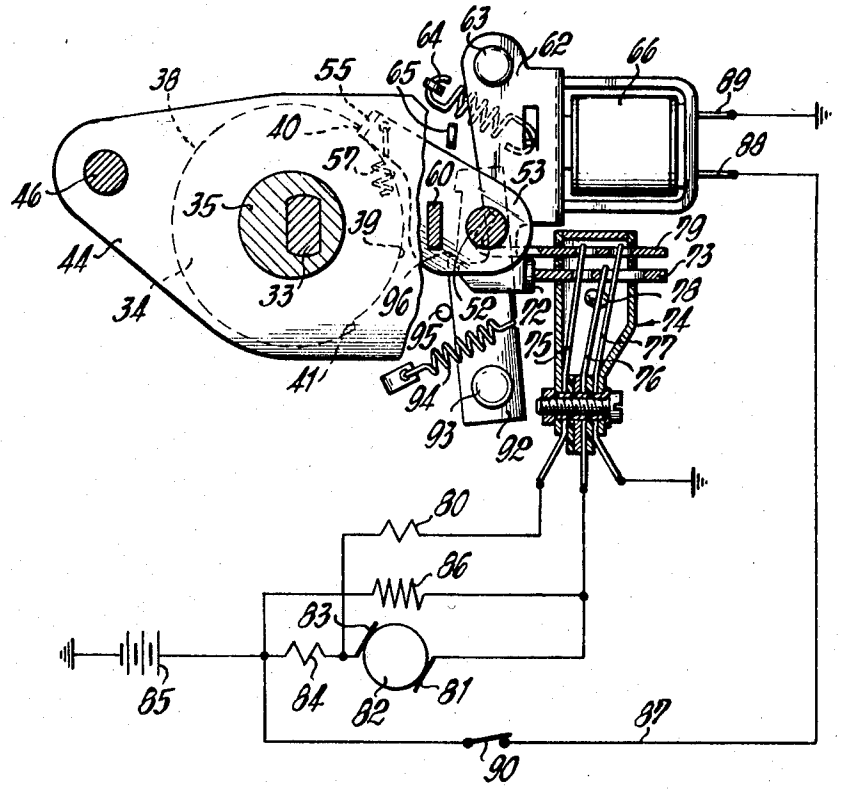

FIG. 6

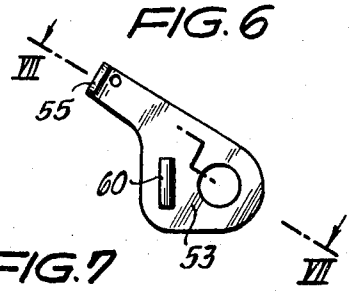

FIG. 7

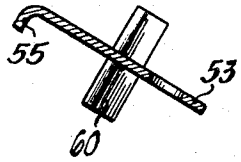

FIG. 8

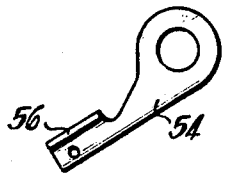

FIG. 9

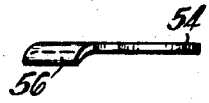

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FIG. 10

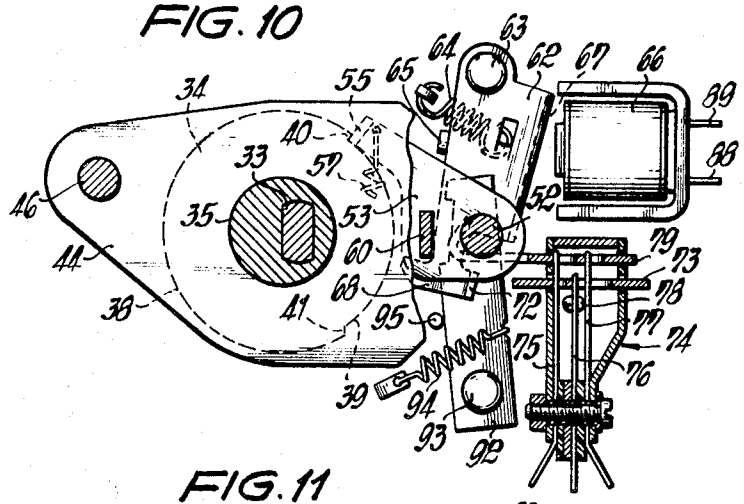


FIG. 11

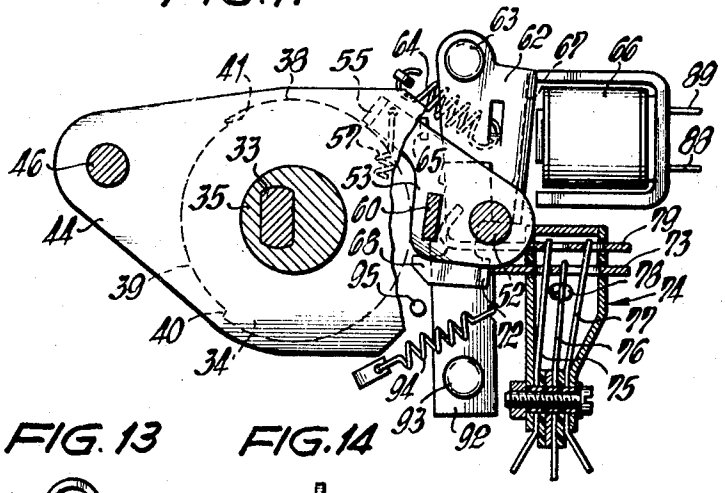


FIG. 13

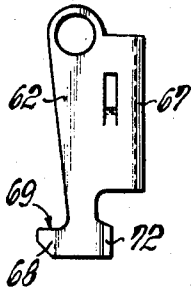


FIG. 14

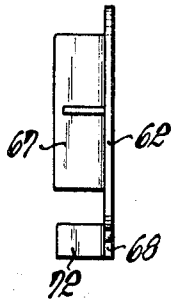
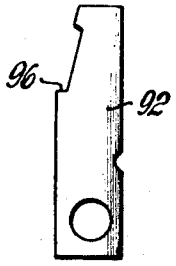


FIG. 15



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United States Patent Office

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WINDSHIELD CLEANER

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Filed Dec. 8, 1967, Ser. No. 689,132
Claims priority, application Germany, Dec. 14, 1966, B 90,297
Int. Cl. B60s 1/24, 1/28
U.S. Cl. 15—250.17 16 Claims

ABSTRACT OF THE DISCLOSURE

A windshield cleaner wherein two blades oscillate in opposite directions between two end positions and are movable from one end position to a parking position. The motor of the windshield cleaner drives a shaft which carries two eccentrics, one for one arm of a two armed crank the other arm of which is coupled to and drives one of the blades. The other blade is coupled to a connector pin of the crank by a pivot pin which is movable radially of the connector pin by the other eccentric. The one arm of the crank is coupled to the shaft by a pawl which can be disengaged by an electromagnet when the driver initiates stoppage of the motor by closing a master switch. The one eccentric then moves the crank radially of the shaft to move the one blade to parking position and the other eccentric moves the pivot pin radially of the output shaft to move the other blade to parking position. The motor is arrested by a switch which is actuated in response to radial movement of the crank.

Background of the invention

The present invention relates to windshield cleaners in general, and more particularly to improvements in windshield cleaners of the type wherein the blades are oscillatable between two end positions and can also move from one end position to a parking position so as not to obstruct the driver's vision.

It is already known to provide a windshield cleaner with a double-throw crank which serves to drive the wiper blades in opposite directions. The crank is located between the pivot axes of the wiper blades and is coupled to such blades by a pair of links which transmit motion to rockers turnable about the pivot axes of the respective blades. The pins of the crank are angularly offset by about 180 degrees to insure that the blades travel in opposite directions. As a rule, the crank is assembled of two simple cranks one of which is driven by the shaft of the motor and the other of which is connected with the crank pin of the one crank. The just described conventional windshield cleaner is further provided with an auxiliary drive for moving the wiper blades to parking positions, preferably by moving the blades downwardly beyond their inner end positions. Such auxiliary drive normally operates on the principle that the distance between the crank pins and the axis of the motor shaft must be changed in order to move the blades beyond their inner end positions. Problems arise in connection with the design of the auxiliary drive because a simple radial displacement of the entire crank does not suffice to move with wiper blades beyond their inner end positions, i.e., such simple radial displacement would cause one of the blades to assume its parking position but the other blade would move from the inner end position toward the outer end position and would obstruct the driver's view. In other words, and in order to move both blades to parking positions, both pins of the crank must move radially inwardly or radially outwardly of the motor shaft. Known auxiliary drives for use in windshield cleaners wherein the blades travel in opposite directions

are therefore provided with means for moving one crank pin of the crank radially of the motor shaft in a first direction while the remainder of the crank moves radially of the motor shaft but in the opposite direction. The distance covered by the one crank pin is twice the distance covered by the remainder of the crank. The one crank pin is reciprocable in the respective portion of the crank pin (which establishes a rigid connection between the two portions of the crank) is hollow to accommodate a shaft of the auxiliary drive. One end of this shaft carries a lever which is connected with the radially movable crank pin by means of a link. The shaft of the auxiliary drive also carries a pinion meshing with a rack mounted on the motor shaft. When the rack causes the pinion to rotate, the one crank pin is caused to move relative to the hollow pin.

The just described auxiliary drive is rather complicated and prone to malfunction because the reciprocable crank pin tends to jam and can cause blocking of the motor as well as serious damage to moving parts of the windshield cleaner. The ways for the reciprocable crank pin undergo extensive wear so that this pin begins to dobble after relatively short periods of use.

Summary of the invention

It is an object of my invention to provide a novel and improved windshield cleaner wherein the wiper blades move in opposite directions and wherein the auxiliary drive which moves the blades to parking positions is simpler, more rugged and more reliable than those in presently known windshield cleaners.

Another object of the invention is to provide the windshield cleaner with a simple crank which can effect movements of wiper blades between two end positions and from one end position to parking position.

A further object of the invention is to provide a windshield cleaner wherein the moving parts undergo less wear than in conventional cleaners of the above outlined characters.

An additional object of the invention is to provide a novel connection between the crank and the prime mover of my windshield cleaner.

Still another object of the invention is to provide a windshield cleaner wherein a single manually operated control element suffices to start the prime mover as well as to initiate stoppage of the prime mover with resulting movement of wiper blades to parking positions.

Briefly outlined, my invnetion is embodied in a windshield cleaner which comprises two wiper elements oscillatable between two end positions to thereby clean predetermined areas of a windshield and also movable beyond one of such end positions to assume parking positions, a crank rotatable about and movable radially of a fixed axis, a first connection for respectively moving one of the wiper elements between its end positions and between the one end position and parking position when the crank respectively rotates about and moves radially of the fixed axis, a second connection for moving the other wiper element between its end positions in response to rotation of the crank, a portion of the second connection being movable radially of the fixed axis to move the other wiper element between the one end position and parking position, a prime mover having a rotary output member defining the fixed axis, first eccentric means provided on the output member for moving the crank radially of the fixed axis, and second eccentric means provided on the output member for moving the aforementioned portion of the second connection radially of the fixed axis substantially simultaneously with radial movement of the crank.

The crank is normally coupled to and rotates with the output member so that the two eccentric means are then

inoperative. Prior to stoppage of the prime mover, the crank is caused to move radially to effect movement of the one wiper element to parking position and the aforementioned portion of the second connection also moves radially to move the other wiper element to parking position.

The novel features which are considered as characteristic of the invention are set forth in particular in the appended claims. The improved windshield cleaner itself, however, both as to its construction and its mode of operation, together with additional features and advantages thereof, will be best understood upon perusal of the following detailed description of a specific embodiment with reference to the accompanying drawing.

Brief description of the drawing

FIG. 1 is a schematic front elevational view of a windshield cleaner which embodies my invention, the wiper elements being shown in their inner end positions;

FIG. 2 is an enlarged fragmentary horizontal sectional view, substantially as seen in the direction of arrows from the line II—II of FIG. 1;

FIG. 3 is a fragmentary vertical sectional view of the windshield cleaner, substantially as seen in the direction of arrows from the line III—III of FIG. 2;

FIG. 4 is a fragmentary vertical sectional view as seen in the direction of arrows from the line IV—IV of FIG. 2;

FIG. 5 is a vertical sectional view similar to that of FIG. 3 but further showing the electric circuit of the windshield cleaner;

FIG. 6 is an elevational view of a pawl in the driving connection between the prime mover and the crank;

FIG. 7 is a sectional view of the pawl as seen in the direction of arrows from the line VII—VII of FIG. 6;

FIG. 8 is a side elevational view of a second pawl in the driving connection between the prime mover and the crank;

FIG. 9 is an end elevational view of the second pawl;

FIG. 10 illustrates certain structure of FIG. 5 but with the parts shown in positions which they assume when the wiper elements are about to move toward parking positions;

FIG. 11 illustrates the structure of FIG. 10 but with the parts shown in positions which they assume when the wiper elements reach their respective parking positions;

FIG. 12 illustrates the structure of FIG. 4 but with the parts shown in positions which they assume when the wiper elements dwell in parked positions;

FIG. 13 is a side elevational view of a blocking member in the structure shown in FIGS. 5, 10, 11;

FIG. 14 is an end elevational view of the blocking member; and

FIG. 15 is a side elevational view of an auxiliary lever in the structure shown in FIGS. 5, 10 and 11.

Description of the preferred embodiment

Referring first to FIG. 1, there is shown a windshield cleaner having a prime mover including an electric motor **20** serving to drive a two-armed crank **21** which in turn drives two links **22, 23** coupled to rockable arms **24***a*, **25***a* of two wiper elements or blades **24, 25**. The arrangement is such that the wiper blades **24, 25** travel in opposite directions, i.e., either toward or away from each other, and each of these blades wipes a portion or field **26** resp. **27** of the windshield. FIG. 1 shows the wiper blades **24, 25** in the inner end positions which they can assume when the windshield cleaner is in normal use. The parking positions of wiper blades **24, 25** are denoted by broken lines, as at **24A, 25A**. In such parking positions, the blades **24, 25** are held outside of the field of vision of the driver.

The motor **20** drives the crank **21** through the intermediary of a suitable step-down transmission **31** which also forms part of the prime mover and is mounted on a plate-like supporting member **30** (FIG. 2) fixed to the body of an automotive vehicle. The output shaft **32** of the transmission **31** has an end portion **33** of other than circular outline which is nonrotatably connected with a disk-shaped motion transmitting member **34** and with two eccentrics **35, 36**. A nut **37** meshes with the tip of the output shaft **32** to hold the parts **34–36** against axial movement. The motion transmitting member **34** (hereinafter called disk for short) is of circular outline and its peripheral surface comprises a larger-diameter portion **38** (FIG. 3) and a smaller-diameter portion **39**. These portions of the peripheral surface are separated from each other by substantially radially extending shoulders **40, 41**. The eccentrics **35, 36** are angularly offset with reference to each other by 180 degrees.

The crank **21** comprises two portions or arms **44, 45** which are disposed in parallel planes (see particularly FIG. 2) and are rigidly connected to each other by a fastener or connector in the form of a pin **46**. The arm **44** is turnable on the eccentric **35** but cannot rotate with reference to this eccentric when the windshield cleaner is in normal use. The manner in which the arm **44** is prevented from rotating on the eccentric **35** will be described hereinafter. The other arm **45** of the crank **21** carries a pivot pin **47** (see FIG. 2) for one end portion of the link **23**. The link **22** is articulately coupled to the crank **21** by means of a pin **48** which is turnable on the fastener or connector **46**. The pin **48** has a diametral slot **49** (see FIGS. 2, 4 and 12) which receives the fastener **46** and permits movements of pin **48** transversely of the fastener. The width of the slot **49** exceeds only slightly the diameter of the fastener **46**. The pin **48** is affixed to a plate-like carriage **50** which is turnable on the eccentric **36**. The parts **22, 24***a*, **48** constitute a connection between the wiper blade **24** and fastener **46** of the crank **21**, and the purpose of this connection is to move the blade **24** between inner and outer end positions when the crank **21** rotates about the axis of the output shaft **32** as well as to move the blade **24** between the inner end position and parking position **24A** when the pin **48** is caused to move radially of the output shaft **32** simultaneously with radial movement of the crank **21**. The parts **23, 25***a*, **47** constitute a connection between the wiper blade **25** and crank **21**, and the purpose of this connection is to respectively move the blade **25** between inner and outer end positions and to move the blade **25** between inner end position and parking position **25A** when the crank **21** respectively rotates about and moves radially of the output shaft **32**.

The arm **44** of the crank **21** further carries a pivot pin **52** which is remote from the connector or fastener **46** and supports two turnable coupling pawls **53, 54** (see FIGS. 3 and 6 to 9). The pawl **53** has a bent portion or pallet **55** (FIGS. 6 and 7) which is located in a plane making an angle of 90 degrees with the general plane of this pawl. The pawl **54** has a similarly bent portion or pallet **56** which extends substantially radially of the pivot pin **52**. The pallets **55, 56** of pawls **53, 54** extend into the plane of the disk **34** and are urged toward each other by a helical contraction spring **57** (FIGS. 2 and 3) which biases the pallets **55, 56** against the peripheral surface of the disk **34**. In the positions shown in FIG. 3, the pallets **55, 56** respectively bear against the shoulders **40, 41** and thereby hold the arm **44** (and thus the entire crank **21**) against rotation with reference to the disk **34** and eccentrics **35, 36**. Consequently, the output shaft **32** can rotate the parts **21, 34, 35** and **36** as a unit.

The pawl **53** is provided with a post or extension **60** which extends beyond both of its sides. One end portion of the post **60** extends with clearance through an opening or cut-out **61** in the arm **44** (see FIG. 3) and limits the extent to which the pawl **53** can turn with reference to the crank **21**. The other end portion of the post **60** extends into the path of movement of a blocking or disengaging lever **62** which is turnable on a pivot pin **63** carried by

the supporting member 30 (see FIGS. 5, 13 and 14). The blocking lever 62 is biased by a helical spring 64 which tends to turn it in a clockwise direction, as viewed in FIG. 5, and to maintain it in an operative position of abutment with a fixed stop 65 provided on the supporting member 30. The blocking lever 62 constitutes the armature of an electromagnet 66 which is mounted on the supporting member 30 and is energizable to move the lever 62 to an inoperative position by turning it in a counterclockwise direction, as viewed in FIG. 5. In order to be more readily attracted in response to energization of the electromagnet 66, the blocking lever 62 is formed with a bent-over portion or wall 67 which is adjacent to the electromagnet. The free end of the lever 62 is provided with a hook 68 which cooperates with one end portion of the post 60 on the pawl 53. When the electromagnet 66 is deenergized, the spring 64 is free to contract and the hook 68 is moved into the path of the post 60 (see FIG. 10). The latter then engages a shoulder 69 of the hook 68, this shoulder being shown in FIG. 13. Thus, the lever 62 can arrest the post 60 so that the latter cannot share the movement of disk 34 about the axis of the output shaft 32. When the electromagnet 66 is energized, it attracts the wall 67 of the blocking lever 62 and moves the latter to the inoperative position shown in FIG. 5. The hook 68 is then located outside of the path of movement of the post 60.

The blocking lever 62 is further provided with a bent-over projection or lug 72 which can shift an actuating member 73 (FIG. 5) for a two-way arresting switch 74. The latter comprises three flexible contacts or tongues 75, 76 and 77. The median contact 76 has a current-conducting head 78. The lug 72 moves the actuating member 73 in a direction to the right, as viewed in FIG. 5, when the electromagnet 66 is energized and moves the blocking lever 62 away from the stop 65 as shown in FIG. 5. The actuating member 73 then urges the head 78 of the median contact 76 against the right-hand contact 77. When the electromagnet 66 is deenergized, the spring 64 maintains the blocking lever 62 in abutment with the stop 65 so that the lug 72 is moved away from the actuating member 73. This is shown in FIGS. 10 and 11.

The arresting switch 74 is further actuatable by a second actuating member 79 which can be displaced by the post 60 of the pawl 53. When the wiper blades 24, 25 are moved to parking positions 24A, 25A, the post 60 is located close to the switch 74 and engages the actuating member 79 to move the latter in a direction to the right, as viewed in FIG. 5, and to cause the contact 75 to engage the head 78 of the median contact 76 while simultaneously holding the right-hand contact 77 away from the median contact. This is shown in FIG. 11.

The median contact 76 is connected with one end of a braking coil 80 of low ohmic resistance, and the contact 76 is connected with a brush 81 of the armature 82 of the electric motor 20. The contact 77 is grounded and the other end of the braking coil 80 is connected with a tap between a field winding 74 and a second brush 83 of the motor 20. The field winding 84 is connected with one pole of an energy source 85, normally the battery in an automotive vehicle. The other pole of the battery 85 is connected to the ground. A second field winding 86 is connected in a branch conductor between the field winding 84 and armature 82. A conductor 87 connects the battery 85 with one terminal 88 of the electromagnet 66 and this conductor 87 contains a master switch 90. The other terminal 89 of the electromagnet 66 is grounded. The master switch 90 can be actuated by hand; its purpose is to start the prime mover of the windshield cleaner and to initiate stoppage to thereby effect movement of wiper blades 24, 25 to parking positions 24A, 25A.

The supporting plate 30 carries a pivot pin 93 for an auxiliary lever 92 (see FIGS. 5 and 15). The lever 92 is biased by a helical spring 94 which urges it into abutment with a stop 95. This lever has an edge face 96 (FIG. 15) whose function will be described hereinafter.

The parts 34, 53 and 54 constitute a simple disengageable coupling between the crank 21 and the output shaft 32. This coupling is disengaged by the blocking lever 62 when the latter is allowed to follow the bias of spring 64 and to assume its operative position (abutment with the stop 65.) The spring 64 constitutes a displacing means by being capable of moving the blocking lever 62 to operative position and the electromagnet 66 constitutes a second displacing means for moving the blocking lever to inoperative position. The main control means of my windshield cleaner includes the spring 64 and master switch 90, such main control means being operative to initiate stopping of the prime mover 20, 31, 32. The delay between the initiation of stoppage (opening of master switch 90) and actual stoppage (by arresting switch 74) is needed to enable the eccentrics 35, 36 to effect movements of wiper blades 24, 25 from inner end positions to parking positions 24A, 25A.

The operation is as follows:

In order to start the prime mover of the windshield cleaner, the driver closes the master switch 90 to energize the electromagnet 66. The latter attracts its armature (blocking lever 62) and maintains it in the position shown in FIG. 5. The post 60 of the pawl 53 is then free to rotate with the disk 34 while the projection 72 moves the actuating member 73 in a direction to the right so that the head 78 of the median contact 76 of the switch 74 engages the right-hand contact 77. The contacts 76, 77 complete a circuit which includes the battery 85 and motor 20, i.e., the motor is in operation and drives the output shaft 32 of the transmission 31 to move the wiper blades 24, 25 back and forth between their end positions in such a way that these blades move toward or away from each other.

When the windshield cleaner is in use, the output shaft 32 of the transmission 31 drives the disk 34 and the radial shoulder 40 of this disk drives the pawl 53 which causes the pivot pin 52 to rotate about the axis of the output shaft. Thus, the shaft 32 rotates the arm 44 and this arm drives the fastener 46 and arm 45. The parts 48, 47 transmit motion to the links 22, 23 which drive the arms 24*a*, 25*a*. This is shown in FIGS. 2 to 4. It will be seen that one of the pawls 53, 54 establishes a driving connection between the output shaft 32 and the crank 21. The crank cannot move relative to the eccentric 35 and, therefore, it cannot move radially of the output shaft 32. The fastener 46 drives the pin 48 and the latter is held against radial movement with reference to the fastener 46 because it is mounted on the carriage 50 cooperating with the eccentric 36 which rotates with the output shaft 32. The pins 47, 48 then orbit along a circular path whose radius R is indicated in FIG. 4.

In order to arrest the windshield cleaner, the driver opens the master switch 90. The electromagnet 66 is deenergized in immediate response to opening of the switch 90 but the motor 20 continues to receive current through the arresting switch 74. The spring 64 is free to pivot the blocking lever 62 toward the stop 65 (see FIG. 10) so that the hook 68 of the lever 62 enters the path of the post 60 which engages the stop face 69 (FIG. 13) when the wiper blades 24, 25 reach their inner end positions shown in FIG. 1 by solid lines. The post 60 is then held against further movement about the axis of the output shaft 32 and the blocking lever 62 exerts upon the pawl 53 a force which suffices to move the pallet 55 away from the radial shoulder 40 of the disk 34. Thus, the lever 62 causes the post 60 to turn the pawl 53 in a clockwise direction, as viewed in FIG. 10. This terminates the driving connection between the disk 34 and arms 44, 45 of the crank 21. The parts 44, 45, 52, 53, 60 are held by the blocking lever 62 while the output shaft 32 continues to rotate with the disk 34 and eccentrics 35, 36. Consequently, the eccentric 35 causes the crank 21 to move radially of the output shaft 32 because this eccentric turns with reference to the arm

44. The pivot pin 47 is caused to leave its circular path (arrow R in FIG. 4) and moves radially of and away from the axis of the output shaft 32. The extent of such radial movement is shown at E in FIG. 12. After the output shaft 32 completes about one-fourth of a revolution subsequent to moving the pawl 53 away from the radial shoulder 40, the shoulder 40 engages the pallet 56 of the pawl 54 and slides therealong (it will be recalled that the pallet 56 extends radially of the pivot pin 52). The pallet 56 then bears against the larger-diameter portion 38 of the peripheral surface on the disk 34.

When the blocking lever 62 holds the arms 44, 45 of the crank 21 against rotation with the output shaft 32, the pin 48 is caused to move radially of the shaft 32 due to the action of the eccentric 36 which cooperates with the carriage 50. The fastener 46 also moves substantially radially while the eccentric 36 rotates with the output shaft 32 to displace the carriage 50 and pin 48. The pin 48 moves in a direction which is counter to the direction of movement of the pivot pin 47 because the eccentrics 35, 36 are angularly offset by 180 degrees. In other words, the axis of the pin 48 also leaves the circular path (radius R) and moves outwardly to move the wiper blade 24 from the solid-line position of FIG. 1 to the parking position 24A. The blade 25 is moved to parking position 25A in response to movement of pivot pin 47 radially and away from the circular path indicated in FIG. 4.

When the arms 44, 45 of the crank 21 move radially, the post 60 also moves away from the axis of the output shaft 32 and transmits motion to the blocking lever 62 whose wall 67 returns into close proximity of the electromagnet 66. The post 60 also engages the auxiliary lever 92 which is turned in a clockwise direction, as viewed in FIG. 11, so that its edge face 96 moves the post 60 (and hence the pawl 53) in a sense to shift the post away from the stop face 69 of the blocking lever 62. This relieves the blocking lever 62 so that it need not furnish the full force which is necessary to hold the post 60. As the post 60 continues to move radially it engages the actuating member 79 and moves the latter in a direction to the right, as viewed in FIG. 11. When the post 60 reaches its extreme right-hand position (FIG. 11), the actuating member 79 moves the contact 77 away from the contact 76 of the arresting switch 74 to open the circuit of the motor 20. Immediately thereafter, the actuating member 79 moves the contact 75 against the contact 76 to connect the braking coil 80 in parallel with the armature 82 in order to effect immediate stoppage of the motor.

As stated before, the wiper blades 24, 25 move downwardly and beyond the solid-line inner end positions of FIG. 1 when the pins 47, 48 move radially outwardly from their circular path (radius R in FIG. 4). When the eccentrics 35, 36 are fully effective, the blades 24, 25 assume the parking positions 24A, 25A and remain in such positions as long as the master switch 90 remains open. During the interval between the time when the post 60 strikes against the hook 68 of the blocking lever 62 and the time when the motor 20 is arrested (i.e., when the wiper blades 24, 25 assume the parking positions 24A, 25A), the output shaft 32 turns the disk 34 and eccentrics 35, 36 through 180 degrees. The pins 47, 48 then assume the positions shown in FIG. 12, i.e., these pins are displaced radially outwardly with reference to their circular path and both by the same distance E. The fastener 46 is then accommodated in the rightmost part of the slot 49 in the pin 48.

In order to restart the windshield cleaner, the driver closes the master switch 90 to energize the electromagnet 66 which attracts the wall 67 of the blocking lever 62. The electromagnet 66 must produce a relatively small force because the wall 67 is already adjacent thereto. This is due to the action of the post 60 and also to the fact that the auxiliary lever 92 holds the post 60 away from the stop face 69 of the blocking lever. As the wall 67 moves against the electromagnet 66, the blocking lever 62 moves the actuating member 73 to the position shown in FIG. 5 to start the motor 20 by causing the actuating member 73 to place the head 68 of the median contact 76 into current-conducting engagement with the right-hand contact 77. The output shaft 32 begins to rotate the disk 34 and eccentrics 35, 36 but the arms 44, 45 and carriage 50 cannot, as yet, participate in rotary movement of the output shaft. This is due to the fact that the auxiliary lever 92 engages and holds the post 60 of the pawl 53. The eccentrics 35, 36 return the crank 21 and the carriage 50 to their normal positions with reference to the output shaft 32 whereby the pivot pins 47, 48 move radially inwardly and cause the wiper blades to move from parking positions 24A, 25A to the solid-line inner end positions of FIG. 1. The post 60 moves toward the output shaft 32 and enables the spring 94 to return the auxiliary lever 92 into abutment with the stop 95. The lever 92 reaches the stop 95 shortly before the action of eccentrics 35, 36 is fully felt, i.e., shortly before the blades 24, 25 return to the solid-line positions of FIG. 1. As soon as the lever 92 strikes against the stop 95, it releases the post 60 which latter is then held in position by slight friction existing between the blades 24, 25 and the windshield as well as by friction between the moving parts of the cleaner. When the shoulder 40 of the disk 34 reengages the pallet 55 of the pawl 53, the arms 44, 45 of the crank member 21 begin to participate in rotary movement of the disk 34 and output shaft 32. The wiper blades 24, 25 then begin to move back and forth toward and away from each other to respectively clean the areas 26 and 27. The axes of the pivot pins 47, 48 travel again along the circular path shown in FIG. 4.

An important advantage of my windshield cleaner is that the auxiliary drive (eccentric 36 and carriage 50) which moves the pivot pin 48 with reference to the crank 21 is less likely to jam than in aforedescribed conventional windshield cleaners. Moreover, the pin 48 and fastener 46 are not subjected to excessive wear because the pin can be guided with a high degree of accuracy. This is due to the fact that the pin 48 is rigid with the carriage 50 and the fastener 46 contacts the walls of the slot 49 in the pin 48 over their entire length. Furthermore, the auxiliary drive 36, 50 for the pin 48 is much simpler than the aforementioned auxiliary drive in a conventional windshield cleaner. The eccentric in the conventional cleaner is used to move the crank radially of the motor shaft but the reciprocable crank pin is movable radially by the aforediscussed link train which receives motion from a rack and pinion assembly.

The coupling between the crank 21 and output shaft 32 occupies very little room, particularly in the axial direction of the output shaft. This coupling can be used with equal advantage in windshield cleaners wherein the wiper blades travel in the same direction. The disk 34 and/or the eccentrics 35, 36 can form integral parts of the output shaft 32.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims:

1. In a windshield cleaner, a combination comprising a pair of wiper elements oscillatable between two end positions to thereby clean predetermined areas of a windshield, each of said elements being further movable beyond one of said end positions thereof to assume a parking position; a crank rotatable about and movable substantially radially of a fixed axis; a first connection for respectively moving one of said elements between said end positions and between said one end position and said parking position when said crank respectively rotates about and moves radially of said axis; a second connection for moving the other of said elements between said end positions in response to rotation of said crank, said second connection having a portion movable substantially radially of said axis relative to said crank to

move said other element between said one end position and said parking position; a prime mover having a rotary output member defining said axis; first eccentric means on said output member for moving said crank radially of said axis; and second eccentric means on said output member for moving said portion of said second connection radially of said axis on radial movement of said crank.

2. A combination as defined in claim 1, wherein said crank comprises a pair of arms and a connector rigidly securing said arms to each other, said first connection comprising a first pivot member affixed to one of said arms and said portion of said second connection comprising a second pivot member rotatable by said connector about said fixed axis and movable relative to said connector substantially radially of said fixed axis.

3. A combination as defined in claim 2, wherein said first eccentric means comprises an eccentric member fixed to said output member and rotatably surrounded by a portion of the other arm of said crank, and further comprising disengageable coupling means provided on said output member and said crank to connect the latter with said output member and to thereby hold said other arm against rotation relative to said eccentric member, blocking means movable from an inoperative to an operative position to disengage said coupling means, and main control means for starting and for initiating stoppage of said prime mover, said main control means comprising displacing means for moving said blocking means to operative position in response to initiation of stoppage of said prime mover.

4. A combination as defined in claim 3, further comprising arresting means for stopping said prime mover with a delay following movement of said blocking means to operative position so as to enable said first and second eccentric means to effect movements of said wiper elements to parking positions subsequent to disengagement of said coupling means.

5. A combination as defined in claim 4, wherein said coupling means comprises a motion transmitting member rigid with said output member and a pawl turnable on the other arm of said crank and engaging said motion transmitting member in inoperative position of said blocking means.

6. A combination as defined in claim 2, wherein said second eccentric means comprises an eccentric member fixed to said output member and a carriage turnable about said eccentric member and connected with said second pivot member.

7. A combination as defined in claim 6, wherein said second pivot member has an elongated slot and said connector is a pin extending through said slot.

8. In a windshield cleaner wherein a wiper element is movable along a windshield between two end positions as well as between one such end position and a parking position, a combination comprising a prime mover having an output member rotatable about a fixed axis; an eccentric fixed to said output member; a disk fixed to said output member and having a substantially radial shoulder; a crank coupled with said wiper element and having an arm turnably mounted on said eccentric; a pawl turnably mounted on said arm and biasing means for urging said pawl against said shoulder to thereby transmit torque from said disk to said crank; blocking means movable between an operative position to thereby disengage said pawl from said shoulder and an inoperative position; main control means including means for starting and for initiating stoppage of said prime mover, means for maintaining said blocking means in inoperative position in response to starting of said prime mover, and means for moving said blocking means to operative position in response to initiation of stoppage of said prime mover so that said output member continues to rotate subsequent to disengagement of said pawl; and arresting means operative to stop said prime mover in response to radial displacement of said arm by said eccentric on continued rotation of said output member.

9. A combination as defined in claim 8, wherein said disk has a second substantially radial shoulder and further comprising a second pawl turnable on said arm and normally biased against said second shoulder.

10. A combination as defined in claim 9, wherein said disk has a peripheral surface including an elongated larger-diameter portion and an elongated smaller-diameter portion, said shoulders being provided between the ends of said elongated portions.

11. A combination as defined in claim 8, wherein said pawl comprises an extension and said blocking means disengages said pawl from said disk through the intermediary of said extension in response to movement to operative position.

12. A combination as defined in claim 11, wherein said blocking means is arranged to hold said arm against rotation with said output member in response to engagement with said extension.

13. A combination as defined in claim 12, wherein said extension comprises a first portion engageable by said blocking means and a second portion extending with predetermined clearance into an opening provided therefor in said arm so that said arm determines the extent to which said pawl is turnable relative thereto.

14. A combination as defined in claim 8, wherein the means for maintaining said blocking means in operative position comprises an electromagnet.

15. A combination as defined in claim 14, wherein said blocking means constitutes the armataure of said electromagnet and further comprising auxiliary means for moving said blocking means away from said operative position toward said inoperative position in response to radial movement of said arm.

16. A combination as defined in claim 15, wherein said pawl comprises an extension which is movable by said blocking means in the operative position thereof and said auxiliary means comprises a lever engaging said extension on latter's movement under the action of said blocking means to move the extension away from a stop face provided on said blocking means.

References Cited

UNITED STATES PATENTS

2,753,721	7/1956	Latta	15—250.17
2,768,530	10/1956	Brundage	15—250.17 X
2,810,294	10/1957	Latta	15—250.17

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