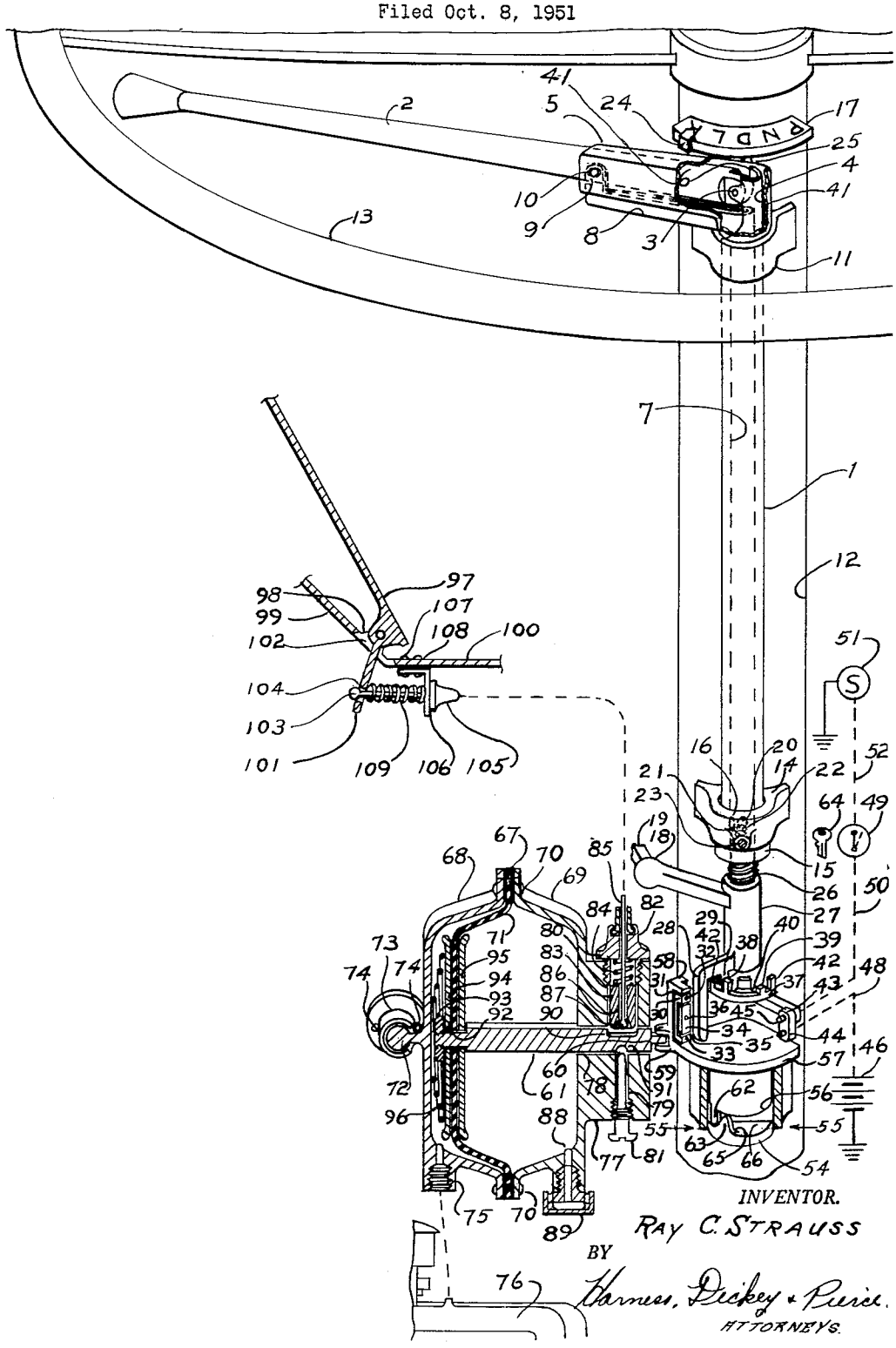
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STARTER CONTROL

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STARTER CONTROL

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This invention relates generally to motor vehicles having change speed transmissions and, in particular, to a device for positioning the transmission selector lever of a motor vehicle at an out-of-gear position for safe motor starting conditions. It also provides a method for starting the motor in an out-of-gear position upon the turning of the ignition key to "on," and further provides a method for combining these features so that the selector lever will be automatically or manually returned to the out-of-gear position before automatically or manually starting the motor.

It is well known that in operating a motor vehicle starting should be accomplished while the motor is out of gear. This precaution is especially important where automatic transmissions are used, since with in-gear starting they have the deceptive quality of seeming to be in neutral until the operator pumps the accelerator for motor warm-up with the result that the vehicle begins to move.

Many manufacturers, for this reason, employ a circuit breaking switch for the starter which permits starting only when the selector lever is moved to an out-of-gear position such as neutral or parking. Such an arrangement requires the driver to first manually shift out of gear and then press the starter button, usually a two-handed operation that frequently distracts and confuses the driver, especially in heavy traffic.

Certain types of semi-automatic starters partially alleviate this situation by combining, for example, the accelerator with the starter, the clutch with the starter, or the ignition switch with the starter, all of them, however, first requiring manual movement of the selector lever to an out-of-gear position.

One of the main objects of this invention is to provide a means for returning the selector lever automatically from an in-gear position to an out-of-gear position as soon as the motor stops.

Another object of this invention is to provide a means for returning the selector automatically from an in-gear position to an out-of-gear position and to combine it with a manual starter or an already built-in semi- or fully-automatic starter.

A further object of this invention is to provide the above-mentioned automatic return-to-neutral feature wherein the lever is locked out of gear with means for engaging the starter until the motor restarts, with the ignition "on," then to disengage said starter and unlock said selector for manual repositioning at an in-gear location.

Another object of this invention is to provide such a means which may be installed upon a vehicle as an accessory quickly and simply.

Another object of this invention is to provide such a means which may be built into the vehicle at the time of manufacture at one of several strategic locations upon the chassis.

A further object of one form of this invention is to provide a safe, out-of-gear condition as soon as the operator turns the motor "off," and to provide a closed starter circuit except for the ignition switch, so that by simply later turning the ignition switch "on" the motor will automatically start and the operator can safely warm the motor up by pumping the accelerator, it being possible at any time after restarting the motor to move the lever to an in-gear position.

Referring now to the drawings for a more detailed description of the present invention and more particularly

to the drawing in which there is illustrated a conventional type of gear selector lever assembly generally designated as 1, employed in progressively selecting the reverse, low, and drive range of an automatic torque converter type of transmission as well as the neutral and park positions.

Assembly 1 employs a conventional shift lever 2, basically pivoted at bearing point 3 in shaft 4, firmly joined to masking hood 5, lever 2 entering shaft 4 at slit 6. Shaft 7, with arm 8 attached at its upper end, passes telescopically through shaft 4, the free extremity of 8 ending in an upwardly projecting elongated pivotal bearing 9 which pivots at 10 around lever 2 under hood 5 cut away at line 41—41, arm 8 also entering shaft 4 at slit 6. Lever assembly 1, by way of shaft 4, is carried near the top end in bearing housing 11, against the upper side of which the lower side of hood 5 bears frictionally. Housing 11, furthermore, is firmly welded to steering column 12, at the upper end of which is shown to be rotatably mounted steering wheel 13. Bearing housing 14, also firmly welded to steering column 12, carries lever assembly 1 at its lower end, there being threadably attached to the lower end of shaft 4 in assembly 1 a collar 15 to bear against the underside of bearing 14. The outer lower surface of shaft 7 has embedded elongated detents 16, collectively designated, in alignment with range selection positions shown on the selector quadrant 17 welded to steering column 12, the detents to register with ball 20 riding in drilled aperture 21 of bearing 14, and held pressed against shaft 4 by spring 22, threaded cap 23 cooperating with bearing 14 to confine spring 22 against ball 20.

Quadrant 17 displays the customary letters R, L, D, N, and P to designate reverse, low, drive, neutral, and park, moving pointer 24 being firmly affixed to hood 5 at point 25 for rotation by lever assembly 1. Spring 26 passes over the exposed projecting lower end of shaft 7 to bear against collar 15 and crank base 27 which caps the lower end of shaft 7 and carries downwardly projecting crank arm 28 with tooth 29 as well as ball-end shifter arm 18 connecting to transmission linkage 19. Crank arm 28 is in alignment with the set-back terrace of arm 58, later to be discussed in further detail, which carries the electrically non-conducting base 30 in countersunk area 31 through attaching screws 32 and 33, there being embedded in the base 30 electrical conducting plate 34 countersunk in area 35 of base 30 and attached to 30 by screw 36.

A range cage 37, having on its arcuate periphery laterally projecting barriers 38 and 39 along arcuate shoulder 40, is welded at its heel portion to steering column 12. It engages tooth 29 of arm 28 and limits the lateral movement of tooth 29 by means of bumper ends collectively numbered 42. Electrically non-conducting arm 43, firmly joined to range cage 37, projects perpendicularly from steering column 12, causing conductor screws 44 and 45, mounted in and projecting through 43, to stand in the path of and to contact plate 34 under conditions subsequently to be described. Grounded battery 46 is connected to terminal screw 44 by lead 48, while switch 49, operated coincidentally with the ignition key 64, is connected to terminal screw 45 by lead 50, switch 49 joining through lead 52 to grounded starter 51.

Bearing housing 54, laterally cut away for illustrative purposes, at level 55—55, and welded firmly to column 12, encases bearing 56 to which is firmly affixed shuttle fan 57 at the outer extremity of which there projects the step-backed arm 58 referred to above and ears 59 for pivotal flexible engagement with tongue end 60 of shaft 61. Bearing 56 is formed with downwardly projecting cam tooth 62 for engagement with shoulder 63 projecting laterally from raceway 65 formed along the lower and inner end surface of bearing bore 66 in housing 54.

Diaphragm housing, generally designated as 67 and shown in cross section, is composed of shells 68 and 69, joined at their concave outer edges by rivets 70 and gripping therebetween the outer edges of diaphragm 71 to form a tightly-sealed enclosed area. At the center of the outer surface of shell 68 there is formed ball projection 72 which is carried in ball support 73 firmly mounted on the frame of the vehicle through cooperating bolts 74, shell 68 being apertured and threaded at 75 for fitting the tubing connection (shown in dotted lines) to manifold 76. Shell 69 has formed on its outer surface bearing housing 77 through which projects to the inner surface at the axial center bearing bore 73, from which radiate bores 79 and 80 to the outer cylindrical surface of 77. Bore 79, partially threaded from its outer end, receives partially threaded screw 81. Bore 80, partially threaded from its outer end, receives threaded flexible shaft housing 82, barrel 83, spring 84, and flexible shaft 85 which projects through drilled cut 86 of barrel 83 to be capped by ball end 87. Shell 69 is apertured and threaded at 88 to receive air cleaner 89.

A detent 90 is recessed in the surface of shaft 61 to receive barrel 83. Another detent 91 is also formed on the surface of shaft 61 to receive the inwardly projecting end of screw 81. Shaft 61 at the end adjacent shell 68 carries smaller diameter threaded projection 92 on which nut 93 grips dished plate 94, diaphragm 71, and dished plate 95. Spring 96 bears expandably against the inner surface of shell 68 and against the depressed surface of dished plate 94.

An accelerator pedal 97 is shown to be mounted by means of stanchion 98 on the inclined portion of floor board 99 of floor board 100 within the driving compartment of the vehicle. Arm 101 rigidly joined to pedal 97, projects through the inclined portion as well as the lower portion of the floor board by way of cut 102 to engage through slot 104 ball end 103 of flexible shaft 85 which enters housing 105 mounted on apertured bracket 106 carried under floor board 100 by rivets 107 and 108. Spring 109 passes over shaft 85 and bears expansibly against arm 101 and bracket 106 normally repressing 97 to the released position shown, shaft 85 connecting through the dotted lines shown with its lower ball end within barrel 83 inside bearing housing 77 of shell 69.

In the operation of the mechanism so far described, assuming the ignition key 64 and switch 49 to be "on" the motor of the vehicle is assumed to be in operation so that a vacuum condition exists within manifold 76, and via aperture 75 communicating therewith, has caused diaphragm 71 to be moved to the position shown compressing spring 96, rotating shuttle fan 57 upon its bearing 56 so that arm 58 is withdrawn to such position that arm 28 has been made free for manual positioning in the reverse gear location behind barrier 38. To allow tooth 29 to clear 38 in assuming this position, it has been necessary to lift lever 2 about pivot point 3, arm 8 following upwardly in elongated bearing 9 so that shaft 7, base 27 and arm 28 are raised, compressing spring 26, for clearance of barrier 38.

With the diaphragm 71 in the position shown downward pressure upon accelerator pedal 97, especially with the motor under heavy load, would cause a sudden drop in vacuum pressure within manifold 76 permitting spring 96 to expand and force diaphragm 71 away from shell 68. Instead, with the construction as shown, downward accelerator pressure compressing spring 109 permits spring 84 to expand with the downward movement of flexible shaft 85 so that barrel 83 falls into detent 90. This locks diaphragm 71 in the position shown until the accelerator is again released by which time vacuum has reaccumulated to withdraw barrel 83 from detent 90.

In the event the motor now stalls while the ignition switch remains "on," vacuum pressure within manifold 76 disappears. Instinctively, the operator pumps the accelerator to verify this condition, and in so doing momentarily withdraws barrel 83 from detent 90 so that spring 96 is free to expand and drive diaphragm 71 and shaft 61 away from shell 68.

Shuttle fan 57 and attached terraced arm 58 can rotate about bearing 56 toward crank arm 28. As the gap between 58 and 28 narrows, cam tooth 62 climbs cam shoulder 63, so that the lower end of crank arm 28, bearing on the upper face of shuttle fan 57, is forced upwardly by 57 to lift tooth 29 above barrier 38, at which point arm 58 on its set-back surface pressures upon crank arm 28 to drive 28 in a counterclockwise direction across the top of barrier 38 and down against arcuate shoulder 40 until 29 contacts the side of stop or barrier 39, a position which centers indicator 24 on N of quadrant 17, at the same time bringing conductor plate 34 into frictional circuit closing contact with terminal screws 44 and 45. Inasmuch as switch 49 is in a closed position, starter 51 immediately restarts the motor to create vacuum in manifold 76 and draw diaphragm 71 and shaft 61 again toward shell 68, breaking the starter circuit in so doing and freeing arm 28 for in-gear manual positioning.

In the event the motor stops because the ignition circuit and consequently switch 49 have been opened by turning key 64 to "off" position, diaphragm 71 and shaft 61 will again upon release of the accelerator move arm 28 to contact barrier 39, swinging indicator 24 to the center of N, the neutral position on quadrant 17. As soon as the ignition switch is again turned "on" by key 64, which closes switch 49, the motor will restart, followed again by the movement above outlined to free selector lever 2 for re-position at an in-gear position.

If the motor will not start because of a weak battery and the operator wants to have the vehicle pushed with the motor in-gear to turn the motor over, arm 58 can be moved manually to the position shown, so that screw 81 can be turned to seat in detent 91, holding shaft 61 and shuttle fan 57, so that manual gear selections can be made and held.

After the selector lever 2 has been automatically moved so that indicator 24 centers over N on the quadrant 17, when the ignition switch has been turned "off," the driver may lift lever 2 to make tooth 29 clear barrier 39 so that indicator 24 can be centered over P on quadrant 17, the parking position of the transmission, and tooth 29 can again drop into contact with the continuation of arcuate shoulder 40. Such manual movement will cause crank arm 28 to move away from contact with arm 58 which has already moved to the limits of its counterclockwise travel. However, contact of conductor plate 34 with heads 44 and 45 continues so that in parking position, when the ignition switch is again turned to "on," causing switch 49 to close, the motor will start and diaphragm 71 along with shaft 61 will move toward shell 68 to withdraw plate 34 from contact with heads 44 and 45 to break the starter circuit, permitting manual in-gear selections.

It will be recognized from the preceding description that in this form of the invention there is both automatic control of the starting of the motor and automatic control of the position of the transmission adjustment member during the period of starting the motor. A device responsive to and actuated by vacuum or lack of vacuum closes a switch in the starter circuit and also moves the selector lever for adjusting the transmission. It is possible to lock the device in an inoperative position by the hand-operated screw 81 or the accelerator operated plunger 80.

It should be clear from the discussions on the foregoing views that the automatic neutral starter herein described provides two major labor-saving operations for the driver of a motor car, namely, means with which to automatically return the selector lever to desired positions, such as neutral or park, and means manually or automatically to start the motor of the vehicle. It should also be clear that combinations can be made of these means, both manual and automatic, as well as combinations of the

manual and automatic intermixed. While the mechanisms herein described exploit a number of such arrangements, it is obvious to and will be understood by those skilled in the art that additional combinations are possible without departing from the spirit or scope of this invention, and that this invention is not intended to be limited to the structures herein shown and described by way of illustration.

I claim:

1. A safe starting device for a motor having a power receiving transmission that is controlled by movement of a selector so that when said selector is in one position said transmission is inoperative to transmit power, but when said selector is in another position said transmission is operative to transmit power, comprising a movable member, means providing a connection between said member and selector whereby said member is adapted to drive and control said selector, first means responsive to the operating condition of the motor for moving the member into driving engagement with the selector whereby said means drives the selector through said member, second means responsive to operation of the motor for moving the member out of driving engagement with the selector whereby the selector may be moved independently of said member, and third means for controlling the path of joint member and selector movement by said first means, and including a stop for positioning said selector so that the transmission is inoperative.

2. A safe starting device for a motor having a power receiving transmission that is controlled by movement of a selector so that when said selector is in one position said transmission is inoperative to transmit power, but when said selector is in another position said transmission is operative to transmit power, comprising a movable member, means providing a connection between said member and selector whereby said member is adapted to drive and control said selector, first means responsive to the operating condition of the motor for moving the member into driving engagement with the selector whereby said means drives the selector through said member, second means responsive to operation of the motor for moving the member out of driving engagement with the selector whereby the selector may be moved independently of said member, and third means for controlling the path of joint member and selector movement by said first means, including a stop for positioning said selector so that the transmission is inoperative, and normally open switch means for controlling starting of the motor, said switch means including a closing element movable with said member and operative to close the switch means when said selector is positioned by said limit stop.

3. In a vehicle having a motor, the combination of a power transmission adjustable to transmit power and not to transmit power, a movable control member to adjust said transmission, a starter for the motor, a circuit for operating the starter, a switch in said circuit, said switch including a movable element controlling closing of said switch, and means adapted to connect the element and member so that said element is capable of closing said switch only when the member is in a position wherein the transmission does not transmit power and automatically moving said control member upon transition of the motor between operating and nonoperating conditions to a position wherein said transmission is adjusted to not transmit power.

4. In a vehicle having a motor, the combination of a power transmission adjustable to transmit power and not to transmit power, a movable control member to adjust said transmission, a starter for the motor, a circuit for operating the starter, a switch in said circuit, said switch including a movable element controlling closing of said switch, means adapted to connect the element and member so that said element is capable of closing said switch only when the member is in a position wherein the transmission does not transmit power and automatically moving said control member immediately upon transition of the motor between operating and nonoperating conditions to a position wherein said transmission is adjusted to not transmit power and means automatically breaking said circuit immediately upon starting of the motor.

5. In a vehicle having a motor, the combination of a power transmission adjustable to transmit power and not to transmit power, a movable control member to adjust said transmission, a starter for the motor, a circuit for operating the starter, a switch in said circuit, said switch including a movable element controlling closing of said switch, means interconnecting the element and member so that said element closes said switch only when the member is in a position wherein the transmission does not transmit power, said means including a device automatically moving said control member to a position wherein the transmission does not transmit power and automatically moving said element to close said circuit, said device being operative automatically when the motor is not operating, said device being inoperative when the motor is operating and in its inoperative condition said device permitting manual operation of the control member.

6. The invention as set forth in claim 5 including accelerator operated lock means for putting said device in an inoperative condition.

7. The invention as set forth in claim 5 including pressure actuated lock means for putting said device in an inoperative condition.

8. The invention as set forth in claim 5 wherein said device includes a diaphragm that is operated by vacuum of the motor.

9. The invention as set forth in claim 5 wherein said device includes actuating means which is energized upon stopping of the motor.

10. The invention as set forth in claim 5 wherein said switch element carries only control current.

11. In a vehicle having a motor, the combination of a power transmission adjustable to transmit power and not to transmit power, a movable control member to adjust said transmission, a starter for the motor, a circuit for operating the starter, a switch in said circuit, said switch including a movable element controlling closing of said switch, means interconnecting the element and member so that said element closes said switch only when the member is in a position wherein the transmission does not transmit power, said means including a device automatically moving said control member to a position wherein the transmission does not transmit power, said device being operative when the motor is not operating, there being an abutment and one-way motion transmitting operating connection between said device and said control member.

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