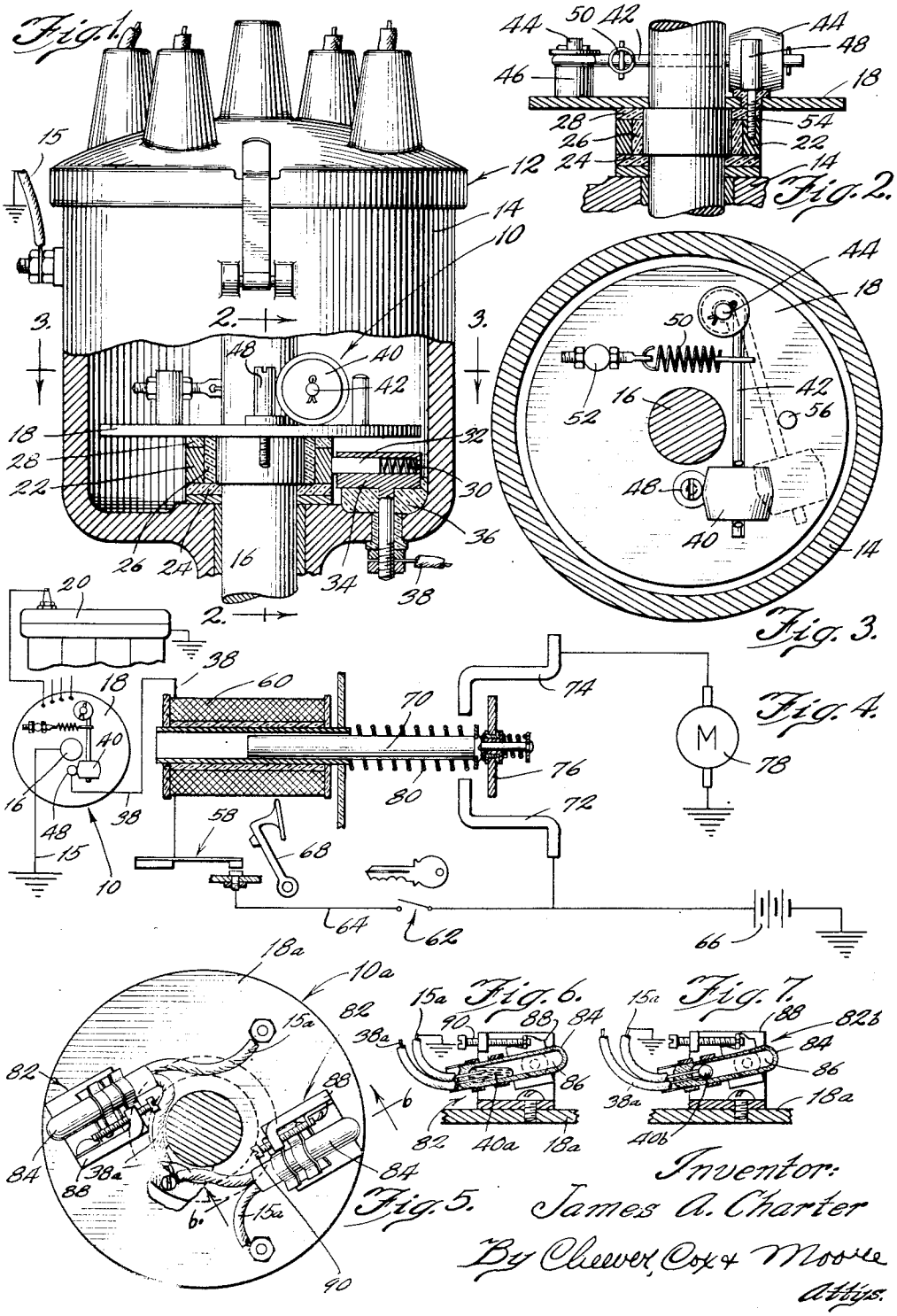
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ENGINE STARTING APPARATUS

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ENGINE STARTING APPARATUS

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2 Claims. (Cl. 200—80)

My invention relates generally to starting apparatus, and more particularly to apparatus for automatically controlling the starting of internal combustion engines.

One of the primary objects of my invention is to provide improved practical means controlled in response to the actuation of an engine driven element for automatically affecting a starting circuit.

More specifically, my invention contemplates an improved device, as set forth above, which is centrifugally operated to control the functioning of said starting circuit, and to this end I propose to provide in combination with a starting circuit, improved means automatically shiftable in response to the action of centrifugal force to render said starting circuit functionally inoperative.

Another object of my invention is to provide a starting apparatus which includes a contact member or element rotatable about an axis and shiftable with respect thereto sufficiently to render a starting circuit functionally inoperative when the engine associated therewith becomes self-actuated.

Still another object of my invention is to provide a centrifugally operated contact element, such as a swinging arm, shiftable meniscus or globule of mercury within a passageway, or a shiftable metallic element or ball within a passageway for controlling the operative functioning of a starting circuit.

Still more specifically, my invention contemplates the combination of a shiftable contact element or control member with the rotary portion of the distributor of an internal combustion engine, the rotation of the distributor serving to affect the position of the contact element associated therewith, whereby to control the functioning of a starting circuit.

The foregoing and numerous other objects and advantages will be more apparent from the following detailed description when considered in connection with the accompanying drawing, wherein—

Figure 1 is a side elevational view, shown partly in section, of a distributor which is equipped with a circuit controlling mechanism constructed in accordance with the teachings of my invention;

Figure 2 is a fragmentary vertical sectional view taken substantially along the line 2—2 of Figure 1;

Figure 3 is a horizontal sectional view taken substantially along the line 3—3 of Figure 1;

Figure 4 is a circuit diagram illustrating my improved system of starter control;

Figure 5 is a plan view of a modified circuit controlling device which includes a pair of adjustably tiltable tubes containing a shiftable mercury contact element;

Figure 6 is a transverse sectional view taken substantially along the line 6—6 of Figure 5; and

Figure 7 discloses still another modification which includes a metallic ball shiftable within the passageway of a tubular member.

Referring now to the drawing more in detail wherein like numerals have been employed to designate similar parts throughout the various figures, it will be seen that my invention contemplates the provision of a circuit controlling device which is designated generally by the numeral 10, Figure 1. For the purpose of illustrating one practical application or combination, I have shown this control mechanism 10 in operative association with a conventional distributor head or mechanism 12.

Inasmuch as the electrical function of the distributor 12 forms no part of the present invention, no specific disclosure nor description thereof is presented in this application. It will suffice to say that the distributor mechanism includes a suitable casing 14 connected to ground through a conductor 15, and a central vertical drive shaft 16 which connects at its upper extremity with distributor elements (not shown).

The circuit control mechanism 10 includes a metallic disk 18 which is mounted upon and rotatable with the shaft 16, it being understood of course that this shaft is driven in any suitable manner from the internal combustion engine 20 with which it is associated. A commutator or contact ring 22 is insulated from the shaft 16 and the disk 18 by suitable insulating members 24, 26, and 28, Figure 1. Contacting with the peripheral surface of the commutator 22 in response to the action of a coil spring 30 is a contact plunger or brush 32. This brush 32 is shiftable within a metallic sleeve 34 which is insulated from the casing 14 by a suitable insulating block 36 and is adapted to be electrically connected by means of a conductor 38 with a circuit, later to be described.

Mounted upon the upper surface of the disk 18, as disclosed in Figures 1 to 3 inclusive, is a contact element or roller 40, which is mounted at the free end of an arm 42, said arm being pivotally secured to the disk 18 by means of a pin 44, Figures 2 and 3. A collar 46, Figure 2, cooperates to maintain the arm 42 substantially

parallel to the disk 18. The contact element or roller 40 is constantly urged toward a companion contact member or terminal 48 through the action of a coil spring 50, which is interposed between the arm 42 and a pin 52 carried by the disk 18. The contact member or terminal 48 is insulated from the disk 18, as clearly shown in Figure 2, and is electrically connected and secured to the commutator 22 by means of a threaded shank 54. A stop pin 56, Figure 3, is provided to limit the outward movement of the arm 42 when said arm is automatically swung outwardly as the shaft 16 rotates.

It will be apparent from the foregoing description that, when the shaft 16 is at rest, the spring 50 causes the roller or contact element 40 to contact with the terminal 48. However, when the engine 20 becomes self-actuated, the speed of rotation of the shaft 16 is sufficient to cause the roller 14 to swing outwardly to the dotted position shown in Figure 3 against the action of the spring 50, thereby breaking contact with the terminal 48. Bearing this description of the control mechanism in mind, I shall now refer to the circuit diagram shown in Figure 4. I have indicated the control mechanism 10 diagrammatically, and it will be seen that the contact member or terminal 48 is electrically connected through the commutator ring 22, the brush 32, the sleeve 36, and the conductor 38 with one side of a contactor 58 through the coil of an electro-magnet 60. The other side of the contactor 58 connects with one side of a key operated switch 62 through a conductor 64. This key operated switch 62 corresponds with the conventional key operated switches now commonly employed on the dash in automobiles, and it will be seen that the other side of this switch is connected to one terminal of a battery 66, the other terminal of said battery being connected to ground. It will also be noted that the contactor 58 is normally open, and that it is closed only when a clutch foot pedal 68 is depressed. Closing the contactor 58 in response to the shifting of the pedal 68 causes the electro-magnet 60 to be energized provided that the contact roller or element 40 occupies its contacting position shown in Figures 3 and 4. Energizing the electro-magnet 60 causes a plunger 70 to be shifted to the left, Figure 4, thereby electrically bridging the gap between a pair of electrical terminals 72 and 74 by means of a contact member 76. This causes a starting motor 78 to be electrically connected with the battery 66.

When the motor 78 has actuated for a sufficient length of time to render the motor or engine 20 self-actuated, the speed at which the distributor shaft 16 is rotating, will be sufficient to effect the outward shifting of the centrifugal contact element 40, thereby breaking the circuit through the electro-magnet 60 and causing the automatic disengagement of the contacting member 76 through the action of a coil spring 80. The subsequent closing of the contactor 58, due to the manipulation of the clutch pedal 68, will have no effect upon the starting circuit as long as the engine maintains its normal running speed. However, should the engine stall, the contact element or roller 40 will suddenly contact with the terminal 48, thereby conditioning the electro-magnet 60 for operation when the contactor 58 is closed. In other words, the centrifugal contact element 40 is movable about the axis of the shaft 16 and driven in response to the actuation of the engine in such a manner that it will shift sufficiently to render the starting circuit functionally inoperative when the engine becomes self-actuated, but will automatically condition the electro-magnet for closing the starting circuit when the speed of the engine is arrested.

In Figure 5 I have disclosed a slightly modified control device indicated generally by the numeral 10a. This device 10a includes a pair of similar mechanisms 82 disposed diametrically opposite each other on a disk 18a. Each of these mechanisms 82 includes a tube 84 provided with an elongated passageway 86 containing a meniscus or globule of mercury 40a. When the disk 18a is at rest, the mercury maintains the position shown in Figure 6, thereby electrically connecting a pair of conductors 38a and 15a. The conductor 38a corresponds to the previously described conductor 38 shown in Figure 4, which serves to connect the contact element 40 with one side of the electro-magnet 60, and the conductor 15a corresponds with the conductor 15 shown in Figure 1, which serves to connect the entire distributor mechanism including the disk 18a to ground. Thus it will be apparent that when the disk 18a is at rest, the circuit including the electro-magnet 60 is conditioned for operation upon the closing of the contactor 58. Likewise, as rotation is experienced by the disk 18a, when the engine becomes self-actuated, the mercury globule 40a will shift to the opposite end of the passageway 86 due to the centrifugal force.

The tubes or casings 84 are each adjustably mounted upon an upright support or member 88, the adjustment thereof being controlled by means of a suitable adjusting screw 90, Figure 6. In this manner the inclination of the tube with respect to the disk 18 may be varied to meet the particular requirements incident to its use. By having a pair of mechanisms 82 disposed in the manner shown, I am able to insure the positive control of the starting circuit regardless of the inclination of the disk 18a with respect to a horizontal plane. Thus, if the disk 18a is employed upon an automobile and said automobile becomes stalled on a hill, one of the mechanisms 82 will function to insure contact between the terminals of the conductors 15a and 38a. Should only one mechanism be employed, conditions may arise in which the mercury will not automatically flow to the end of the tube containing the conductors, and under such conditions the electro-magnet would not be conditioned for effecting the subsequent closing of the starting circuit. By employing a pair of these mechanisms 82, however, the above mentioned difficulty is entirely obviated.

In Figure 7 a slightly modified mechanism is disclosed which I have designated generally by the numeral 82b. The mechanism is similar in every respect to the mechanism 82, with the exception that the shiftable centrifugal contact element 40b is a metallic ball instead of a globule of mercury. In all other respects the device operates similarly to the mechanism 82, and I employ a pair of such devices in the manner shown in Figure 5.

From the foregoing it will be apparent that my invention contemplates the provision of a simple and improved control apparatus, in which a shiftable contact element is centrifugally controlled to effect the opening of a starting circuit. It will be apparent that the elements 40, 40a, and 40b will shift when the engine becomes self-actuated, so as to render the starting circuit functionally inoperative. These contact elements are conveniently arranged so as to automatically condition an electro-magnet or other

suitable device to effect the closing of the starting circuit when the actuation of the engine is arrested. My improved control mechanism is of extremely simple construction and adapted to be installed without dismantling motor parts and with a minimum amount of skill and effort.

Obviously other modifications and changes may be made without departing from the spirit and scope of the present invention, and said invention should only be limited by the scope of the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In starting mechanism for internal combustion engines and the like, a drive shaft, a supporting plate mounted on said shaft in a plane at right angles to the axis of said shaft, a plurality of tubes each adapted to contain a body of mercury, a body of mercury in each tube, mountings for said tubes allowing rotation thereof about a horizontal axis, said tubes being secured by said mountings about said shaft on said plate in outwardly and upwardly slanted positions in planes parallel to the axis of said shaft and coincident with tangents to a circle concentric with said shaft but smaller than said plate, screw adjusting means carried by said mountings for varying the upward slant of said tubes, and a pair of contacts in the inner and lower end of each tube and adapted to be connected by the body of mercury therein, said bodies of mercury connecting said contacts when said plate is stationary or rotating at less than a selected speed, and leaving said contacts to remove the connection therebetween upon a sudden acceleration of the rotation of said plate or upon said plate rotating at more than said selected speed.

2. In starting mechanism for internal combustion engines and the like, a drive shaft, a supporting plate mounted on said shaft in a plane at right angles to the axis of said shaft, a plurality of tubes each adapted to contain a body of mercury, a body of mercury in each tube, said tubes being mounted about said shaft on said plate in outwardly and upwardly slanted positions in planes parallel to the axis of said shaft and coincident with tangents to a circle concentric with said shaft but smaller than said plate, and a pair of contacts in the inner and lower end of each tube and adapted to be connected by the body of mercury therein, said bodies of mercury connecting said contacts when said plate is stationary or rotating at less than a selected speed, and leaving said contacts to remove the connection therebetween upon a sudden acceleration of the rotation of said plate or upon said plate rotating at more than said selected speed.

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