

[54] **SPEED LIMITER AND ALARM FOR
 INTERNAL COMBUSTION ENGINE**

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[52] **U.S. Cl.**..... **340/53, 340/263, 180/105 E**

[51] **Int. Cl.**..... **B60q 1/54**

[58] **Field of Search**..... **340/53, 62, 263,
 340/264; 180/98, 105 R, 105 E**

[56] **References Cited**

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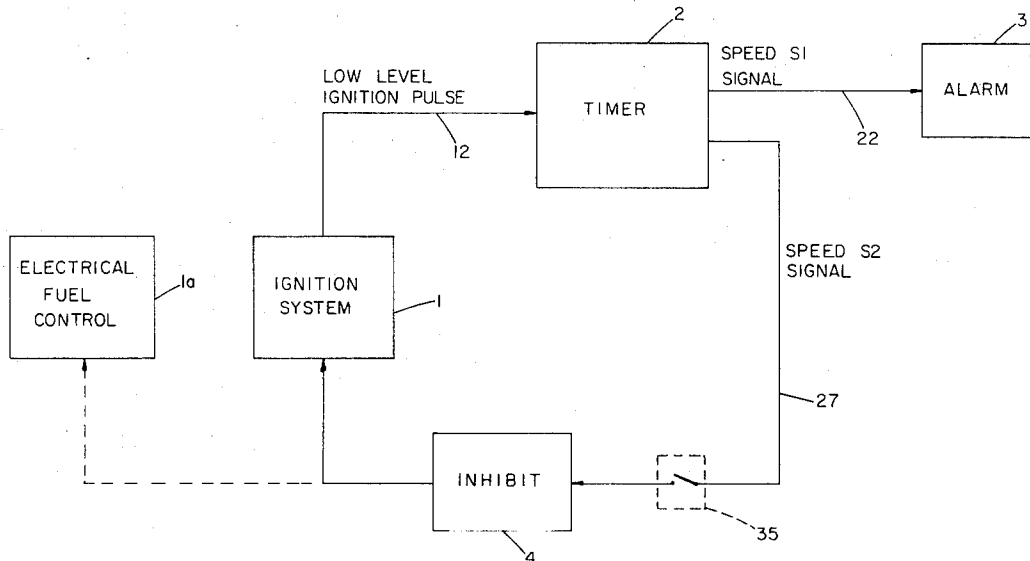
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[57] **ABSTRACT**

Speed limiter and alarms for internal combustion engines, especially automobiles. Signals from the ignition system trigger the limiter or alarm devices. Shift registers and digital counters shift with or count pulses spaced apart in accordance with automobile speed. Reaching a certain stage or count prior to a timed reset pulse results in a generation of a signal useful to set an alarm or inhibit the speed. Cyclic operation of the system maintains a constant watch on the speed. A flip flop set by coincidence of the shift stage or count and a reset pulse energizes the signal, and absence of the shift stage or count at the time of a reset pulse, unsets the flip flop, deactivating the signal. The signal can energize or de-energize electronic or conventional warning, ignition or fuel pump devices.

12 Claims, 5 Drawing Figures



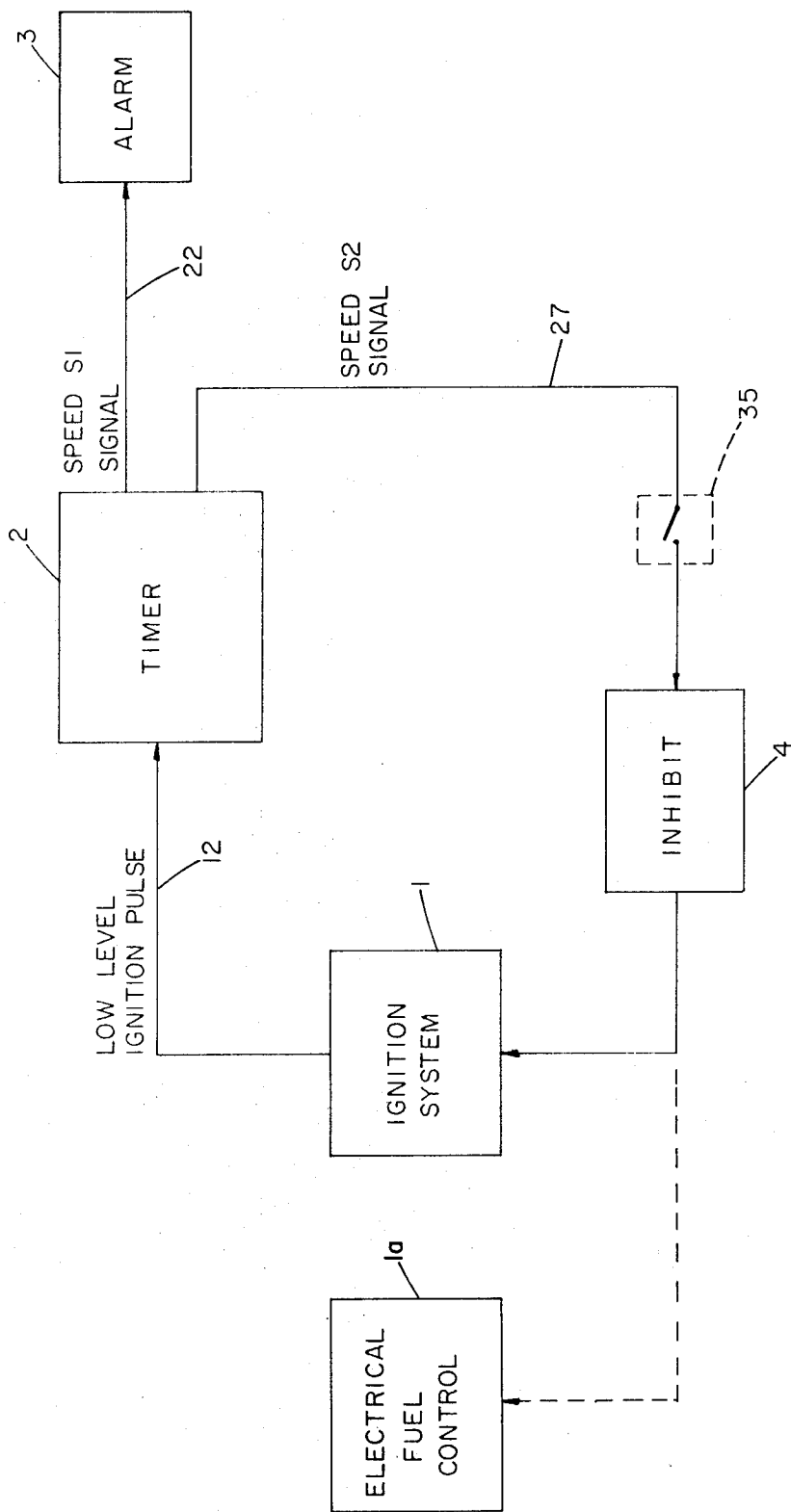


FIG 1

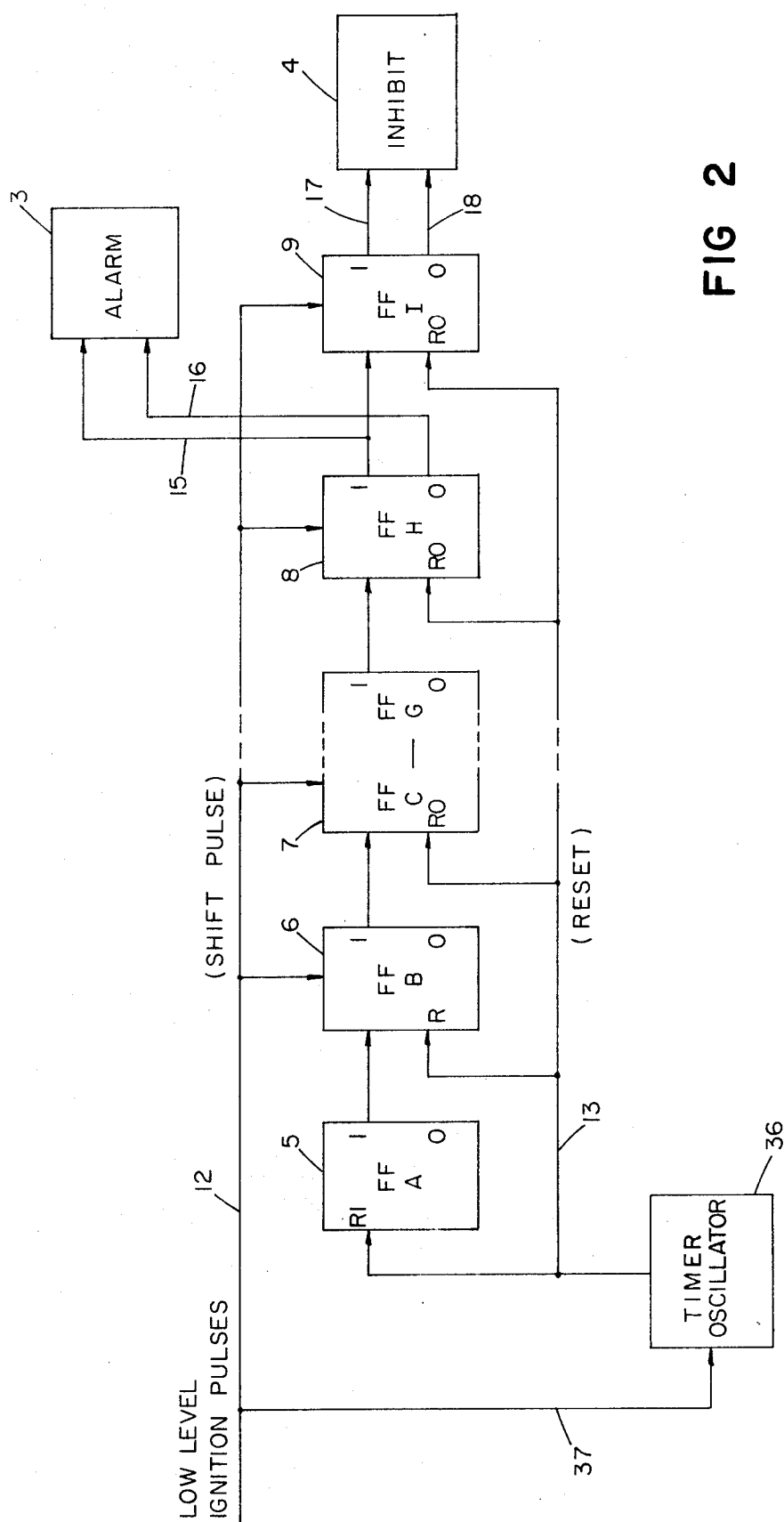
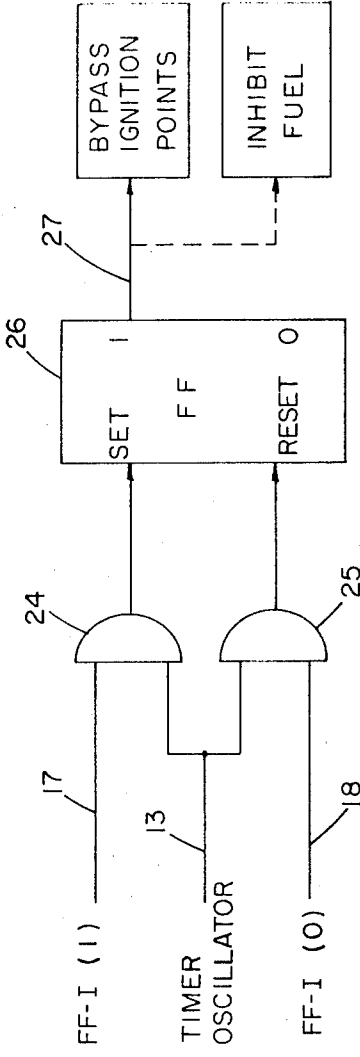
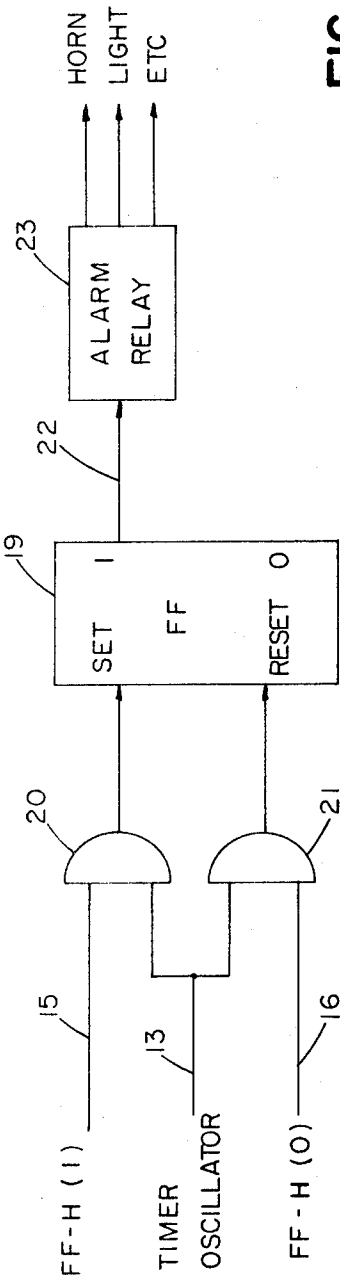


FIG 2



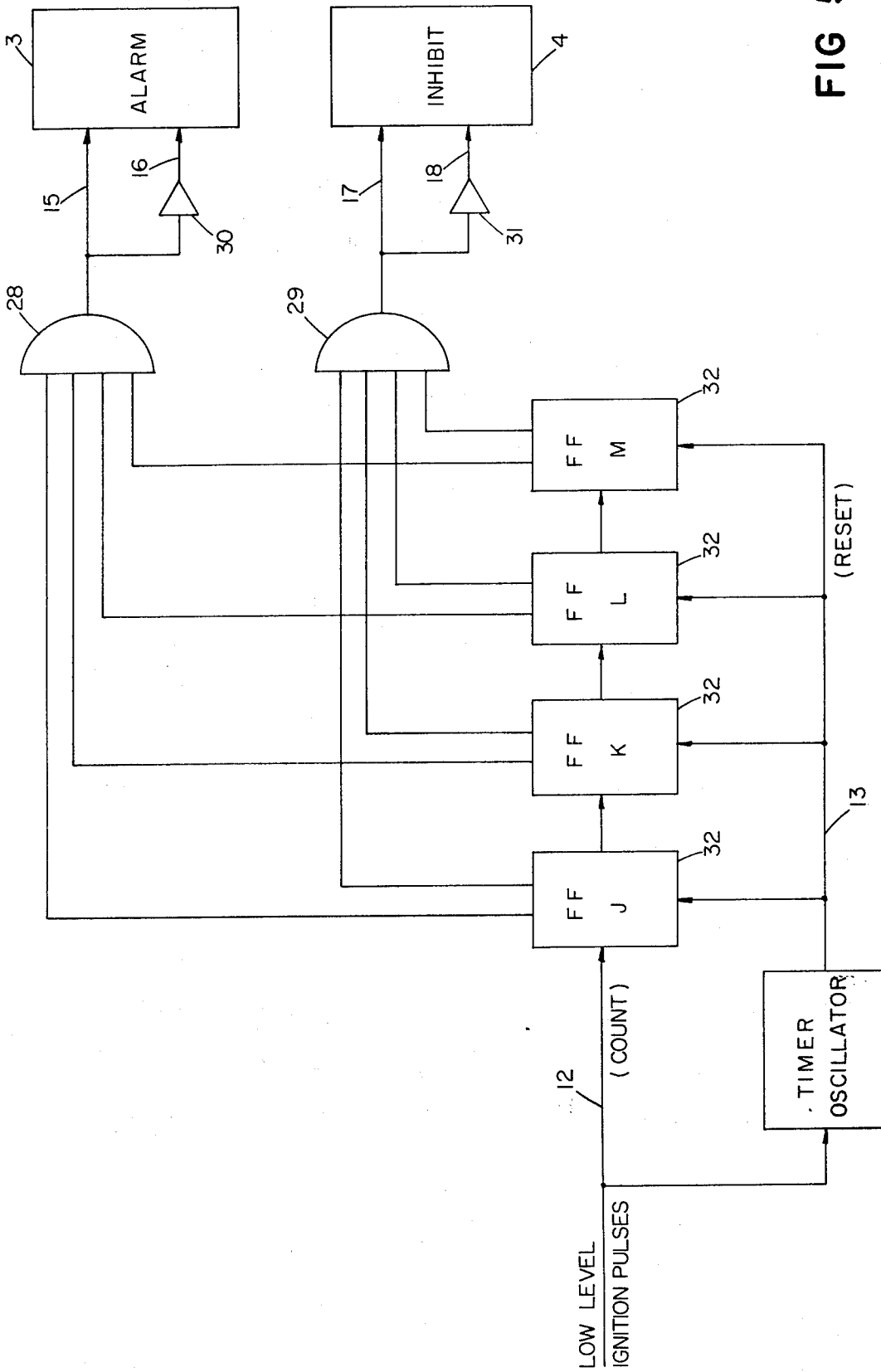


FIG 5

SPEED LIMITER AND ALARM FOR INTERNAL COMBUSTION ENGINE

This invention concerns a speed limiter and alarm system for internal combustion engines such as are used for automobiles. It is desirable for safety purposes to give a warning to the driver when he exceeds a predetermined speed and to prevent him from going faster than a second higher predetermined speed. The warning at the lower speed allows him to utilize that speed for emergency conditions while making him continuously aware of exceeding that speed, while the higher speed limitation prevents him under any condition from exceeding a higher preset speed. For example, at 80 miles per hour the horn might blow and the lights might be turned on, either continuously or flashing, and the maximum speed might be 90 miles per hour. Previous methods have employed pickoffs from engine or transmission shafts, with the revolution time being calculated electrically or digitally for each revolution and with speed preventing or indicating devices being actuated when the instantaneous speed has been exceeded.

Devices according to the present invention utilize the ignition system of the engine for triggering limiter or alarm devices and can control the ignition system or electronic fuel system of the engine directly. Devices according to the invention also utilize digital shift registers shifted by speed pulses, and comparison of the amount of shift to a predetermined clock period.

The invention permits utilization of simply manufactured and adjusted electronic and digital components, allowing a device to be made and installed at very low cost to perform both warning and speed limiting functions. In the drawings:

FIG. 1 is a block diagram of a system according to the invention;

FIG. 2 is a circuit diagram in greater detail of a preferred embodiment;

FIGS. 3 and 4 are circuit diagrams of an alarm circuit and an inhibit circuit useful with the embodiment of FIG. 2; and

FIG. 5 is a circuit diagram of another preferred embodiment.

Referring to FIG. 1 the system receives low voltage level ignition pulses 12 from the ignition system 1 of the engine, and applies them to a digital timer 2. At a preset speed S1, a signal 22 actuates an alarm 3. At a preset speed S2 a signal 27 from the timer causes an inhibit circuit 4 to inhibit further high level ignition pulses in the ignition system 1 or shuts off an electronic fuel control 1a.

SIGNAL INPUT

The signal input is the opening or closing of the ignition contact points in a conventional distributor of an internal combustion engine or the equivalent thereof from a photo-electric, magnetic, or other "non-contact point" distributor. This signal is at low voltage (typically 12 volts). In the normal internal combustion engine each such opening of the points, or the equivalent thereof, causes the high voltage secondary circuit of the distributorcoil combination to make a spark plug fire. This signal input is a suitable input for the conventional automobile for limiting maximum speed. With an automatic transmission, when the engine speed (RPM), which is indicated by the signal input, is at a speed where it is desired to cause an alarm or limit speed, the

transmission is in its fastest gear ratio. With a manual transmission, the speed limitation can either be actually the engine speed, with the possibility of false alarms or speed limiting in lower gears, or a logical scale factor dependent on transmission gear can be added. In FIG. 1 the dotted line indication of switch 35 represents a switch which remains closed only in response to the automobile being in the highest gear. This excludes action when the engine is operating at high engine speed (RPM) but at lower gear ratios.

TIMING

Referring still to FIG. 1, low-level ignition pulses 12 are entered into the timer 2. The timer counts the pulses until a timer oscillator resets the counter circuits. If the count has achieved certain predetermined counts, the alarm 3 or inhibit circuits 4 are actuated.

The preferred system of FIG. 2 utilizes a shift register as a counter. The timer oscillator 36 has a fixed oscillating frequency that is low in comparison to the frequency of the ignition pulses 12 at those high speeds which are to cause alarms or speed-limiting. This oscillator resets the timer flip-flops 5-9. It is preferable that the timer oscillator be triggered by one of the low level pulses 12 (along lead 37) to ensure accurate control. Resetting of the flip-flops 5-9 causes flip-flop 5 (A) to be reset to the logical 1 state and all other flip-flops 6-9 (B-I) to be reset to the logical 0 state. The low level ignition pulses 12, cause the logical 1 entered to be shifted with each opening of the ignition points or equivalent, from one flip-flop to the next. All flip-flops up to the one being shifted will have logical 1's and following flip-flops will have logical 0's. If flip-flop 8 (H) is set to the logical 1 state before the timer oscillator has reset all flip-flops, this logical 1 signal 15 activates the alarm 3. If flip-flop 9 (I) is activated to the logical 1 state, this signal 17 is utilized to inhibit the engine through inhibit circuit 4. An example of possible timings for an automobile is as follows:

tire size — 80 inches circumference

final gear ratio — 4.55:1

cylinders — 8

with a timer oscillator frequency of 40 hz.

Flip-flop H (FFH, FIG. 3) will be 1, causing alarm, at 80 mph.

Flip-flop I (FFI, FIG. H) will be 1, causing inhibit, at 90 mph.

Naturally, different tire and final gear ratios will require oscillator frequency changes. Also different numbers of flip-flops can be used, with attendant changes to other parameters.

Referring to FIG. 5, an alternate system is to utilize a conventional counter and a logical decoder. Flip-flops J-M 32 are connected as counter flip-flops. Timer oscillator pulse 13 clears the counter. Ignition pulses 12 are counted. AND gate 28 is wired to indicate a preselected count for alarm conditions. Inverter 30 is a logical indication that the count is not present. AND gate 29 is wired to indicate a second preselected count for inhibit conditions, with inverter 31 giving a logical indication that the count is not present. (It will be understood that each wire connecting a flip-flop to an "AND" gate is selected to carry a signal representing the 1 state or its complement, depending upon the particular binary count selected.)

ALARM SIGNALS

Referring to FIGS. 2 and 3, if flip-flop H is in the 1 state when the reset pulse 13 from the timer oscillator 36 arrives, AND gate 20 sets flip-flop 19, causing a signal 22 to remain on. This is utilized to actuate the alarm relay 23 to turn on either continuously or intermittently electrical devices such as lights, horns or electronic alerting devices. When the engine slows down so that in a succeeding cycle of the timer, the reset signal 13 arrives before flip-flop H has been turned to the 1 state, the flip-flop H 0 signal 16 along with the reset pulse 13 through AND gate 21 turns off flip-flop 19 and thereby shuts off signal 22 and the alarm relay 23.

IGNITION INHIBIT

Referring to FIGS. 2 and 4 in a similar fashion, the 1 state of flip-flop I on line 17 with reset pulse 13, through AND gate 24, turns flip-flop 26 on to inhibit ignition firing. The inhibit is turned off when the reset pulse 13 combines with the flip-flop I 0 line 18 in gate 25 to shut off flip-flop 26. Firing is inhibited either by bypassing the mechanical ignition point with an electronic switch or by inhibiting the electronic circuitry in the low voltage side of an electronic ignition system. If electrical or electronic fuel control is utilized such as with a fuel injector, the signal could also be used to inhibit fuel flow.

I claim:

1. A system for internal combustion engines to cause alarm at one speed and to prevent the exceeding of a second speed said system including means for utilizing the count of ignition pulses within a preset time, with a first preset count causing an alarm and a second preset count inhibiting the engine speed, the system having an ignition pulse counter comprising a shift register, with the shifts being caused by signals from the ignition points or their electronic equivalent opening or closing and with the shift register being reset by a timer pulse, and means to provide an alarm signal if the shift register shifts to one point, and to provide an inhibit signal if the shift register shifts to a second point within a preset time period.

2. A system for internal combustion engines to cause alarm at one speed and to prevent the exceeding of a second speed said system including means for utilizing the count of ignition pulses within a preset time, with a first preset count causing an alarm and a second preset count inhibiting the engine speed, the system having an ignition counter comprising a conventional digital counter, with counts being activated by signals from the ignition points or their electronic equivalent opening or closing, and a logical decoder of a predetermined count within a preset time period adapted to generate the alarm signal and a second decoder with a higher count adapted to generate the inhibit signal.

3. A system for automobiles to generate a signal of a preselected speed, said system including a digital shift register, a timer for generating time signals, means for supplying a series of speed pulses to said shift register

in the manner to cause each to shift said shift register, the time between said speed pulses representing automobile speed, and means to provide said signal of a preselected speed if the shift register shifts to a preselected point along said shift register prior to occurrence of a time signal generated by said timer.

4. A system as described in claim 3 including a signal flip-flop, and connections whereby coincidence of a pulse from said preselected point and the time signal from the timer causes said flip-flop to be set, causing said signal of a preselected speed to be generated, and absence of a pulse from said point and the time signal from the timer causes said flip-flop to be reset, turning off said signal.

5. The system of claim 3 wherein there are at least two preselected points along said shift register representing different automobile speeds, and means to generate a different signal for each of said points, when the shift reaches the respective point prior to the next time signal.

6. The system of claim 5 wherein the first of said signals is adapted to set off an alarm and the second of said signals, representing a faster automobile speed, is adapted to inhibit the operation of said automobile.

7. The system of claim 3 wherein said means to produce said speed pulses comprises a connection for electrical pulses from the timed ignition system of said automobile.

8. A system for automobiles to generate a signal of a preselected speed, said system including a digital counter, a timer for generating periodic time signals, means for supplying a series of speed pulses to said shift register in the manner to cause each to increase incrementally the count in said counter, the time between said speed pulses representing automobile speed and means to provide said signal of a preselected speed if the counter reaches a preselected count within the period of said time signals.

9. A system as described in claim 8 including a signal flip flop and connections whereby coincidence of a logically decoded count and the time signal from the timer causes the flip-flop to be set, causing said signal to be generated, and where the lack of a logically decoded count and the time signal from the timer causes said flip-flop to be reset, turning off said signal.

10. The system of claim 9 wherein there are at least two preselected counts representing different automobile speeds, and means to generate a different signal for each of said counts, when the counter reaches the respective count prior to the next periodic time signal.

11. The system of claim 10 wherein the first of said signals is adapted to set off an alarm and the second of said signals, representing a faster automobile speed, is adapted to inhibit the operation of said automobile.

12. The system of claim 8 wherein said means to produce said speed pulses comprises a connection for electrical pulses from the timed ignition system of said automobile.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,748,641 Dated July 24, 1973

Inventor(s) Dudley B. Hartung

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Col. 4, lines 32 and 33, change "shift register"
to --counter--.

Signed and sealed this 19th day of February 1974.

(SEAL)

Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents