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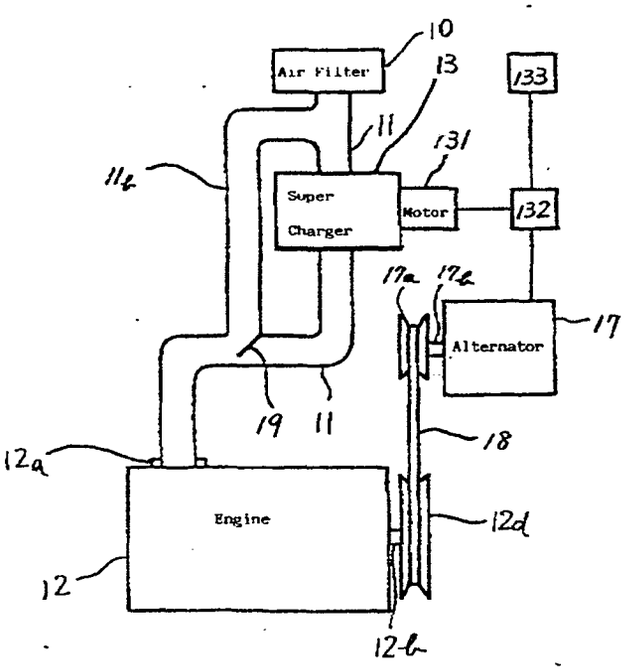
(54) Supercharger.

(57) An air intake system of an internal combustion engine (12) including a supercharger (13) comprises an air intake pipe (11) connecting an air inlet port (12a) of an internal combustion engine (12) to a supercharger (13). The supercharger (13) is directly driven by a motor (131) of which rotation is controllable.

Fig. 3



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SUPERCHARGER

The present invention relates to an air intake system of an internal combustion engine, more particularly, the present invention relates to an air intake system of an internal combustion engine including a supercharger.

Referring to Figure 1, an air intake system of an internal combustion engine including a supercharger which is driven by a dynamic power of the internal combustion engine is shown.

The above mentioned air intake system comprises an air filter 10, an air intake pipe 11 connecting air filter 10 to an air intake port 12a of an internal combustion engine 12 and a supercharger 13. Supercharger 13 is disposed between air filter 10 and engine 12 and it is connected to both air filter 10 and engine 12 by air intake pipe 11. Air intake pipe 11a is disposed between air filter 10 and engine 12 to bypass supercharger 13. Accordingly, one end of bypassing air intake pipe 11a connects to air intake pipe 11 which is disposed between air filter 10 and supercharger 13, and another end of bypassing air intake pipe 11a connects to air intake pipe 11 which is disposed between supercharger 13 and air inlet port 12a of engine 12. The connection between one end of bypassing air intake pipe 11a and air intake pipe 11 is accomplished by using a three-way valve or cock 14.

A clutch mechanism 15 controls release and connection of dynamic power to supercharger 13 in response to an output demand to engine 12. A belt 16 transfers dynamic power to the clutch from the engine 12. An engine drive shaft 12b transfers the engine power to pulley 12c which drives belt 16.

In operation, when the output demand to the engine 12 is equal to or more than a predetermined value, air passing through air filter 10 is taken into supercharger 13 and then is supercharged to air inlet port 12a of engine 12 due to the connection of dynamic power from engine 12 to supercharger 13 through clutch mechanism 15. On the other hand, when the output demand to the engine 12 is less than the predetermined value, air passing through air filter 10 is directly taken into air inlet port 12a of engine 12 through bypassing air intake pipe 11a due to both the release of dynamic power from engine 12 to supercharger 13 through clutch mechanism 15 and by changing the direction of three-way valve 14.

However, the above mentioned air intake system of an internal combustion engine has problems as follows. One problem is that there is a considerable restriction to arrangement of devices which are disposed in an engine compartment of automobile due to using belt 16 to transfer dynamic power from engine 12 to supercharger 13 of the air intake system. Another problem is an undesirable torque fluctuation of the internal combustion engine 12 due to the clutch mechanism 15 controlling the release and connection of dynamic power to supercharger 13 in response to an output demand to engine 12.

It is a primary object to eliminate a belt which drives a supercharger through a clutch mechanism in order to reduce both a space restriction and an arrangement of device restriction in an engine compartment of an automobile.

It is another object of this invention to eliminate an undesirable torque fluctuation of an internal combustion engine due to a clutch mechanism controlling the release and connection of dynamic power to a supercharger in response to an output demand to engine 12.

An air intake system of an internal combustion engine according to this invention includes a conduit and a supercharger. The conduit connects to an air inlet port of an internal combustion engine. The supercharger is located within the conduit.

According to this invention, the supercharger is directly driven by a motor of which rotation is controllable.

Figure 1 is a schematic block diagram of an air intake system of an internal combustion engine including a supercharger.

Figure 2 is a schematic block diagram of one air intake system of an internal combustion engine including a supercharger and motor arrangement in accordance with the present invention.

Figure 3 is a schematic block diagram of another air intake system of an internal combustion engine including a supercharger and motor arrangement in accordance with the present invention.

Referring to Figure 2, an air intake system of an internal combustion engine in accordance with one embodiment of this invention is shown. The same construction is accorded like numerals as shown with respect to Figure 1.

The air intake system of an internal combustion engine includes an air filter 10, an air intake pipe 11 connecting air filter 10 to an air inlet port 12a of an internal combustion engine 12 and a supercharger 13. Supercharger 13 is disposed between air filter 10 and engine 12 and it is connected to both air filter 10 and engine 12 by air intake pipe 11. Motor 131 is attached to supercharger 13 and directly drives the supercharger 13.

A motor rotation control circuit 132 is connected to motor 131, a transducer 133 and an alternator 17 through wire, respectively. Motor rotation control circuit 132 controls a rotation of motor 131 in response to a signal which is received from transducer 133 and simultaneously rectifies an alternating current generated by alternator 17 to a direct current. Transducer 133 transduces a stepping amount of an accelerator of an automobile as an output demand to engine 12 to an electrical signal and sends the electrical signal to motor rotation control circuit 132. Alternator 17 generating alternating current is driven by a dynamic power of engine 12 through a belt 18. The belt 18 engages a pulley 12d, which is attached to a drive shaft 12b of engine 12, with a pulley 17a attached to a shaft 17b of alternator 17.

In operation, when the accelerator of the automobile is stepped, namely, as the output of engine 12 is demanded, the stepping amount of the accelerator is transduced to a proper electrical signal, and the proper electrical signal is sent to motor rotation control circuit 132. Motor rotation control circuit 132 controls the rotation of motor 131 in response to the electrical signal from transducer 133. As a result, motor 131 rotates to drive supercharger 13 directly in response to the output demand of engine 12.

Referring to Figure 3, an air intake system of an internal combustion engine in accordance with another embodiment of this invention is shown. The same construction is accorded like numerals as shown with respect to Figure 3 and the description of some of the identical elements is substantially omitted.

A bypassing air intake pipe 11b is disposed between the air filter 10 and the engine 12 to bypass the supercharger 13. Accordingly, one end of the bypassing air intake pipe 11b connects to the air intake pipe 11, which is disposed between the air filter 10 and the supercharger 13, and another end of the bypassing air intake pipe 11b connects to the air intake pipe 11 which is disposed between the supercharger 13 and the air inlet port 12a of the internal combustion engine 12. A flap valve 19 is disposed at a junction of the bypassing air intake pipe 11b and the air intake pipe 11 which is disposed between the supercharger 13 and the air inlet port 12a of the internal combustion engine 12.

In operation, when the electrical signal from transducer 133 is equal to or more than a predetermined value, namely, the output demand to engine 12 is equal to or more than a predetermined value, motor 131 rotates to drive supercharger 13 directly under control of motor rotation control circuit 132. Subsequently, another end of bypassing air intake pipe 11b is closed by flap valve 19 due to flap valve 19 being pushed up by compressed air which is blown from supercharger 13. Accordingly, air passing through air filter 10 is taken into supercharger 13 and then is supercharged to air inlet port 12a of engine 12 without going through by passing air intake pipe 11b.

On the other hand, when the electrical signal from transducer 133 is less than a predetermined value, namely, the output demand to engine 12 is less than a predetermined value, supercharger 13 stops its operation due to motor 131 being stopped by motor rotation control circuit 132. Subsequently, another end of bypassing air intake pipe 11b is opening due to flap valve 19 falling by virtue of its own weight. Accordingly, air passing through air filter 10 is directly taken into air inlet port 12a of engine 12 through bypassing air intake pipe 11b.

Claims

1. In an air intake system of an internal combustion engine (12) including a conduit (11) connecting an air inlet port (12a) of an internal combustion engine (12) to a supercharger (13) which is located within said conduit (11), the improvement comprising:
a motor (131) directly driving the supercharger (13); and means (132), connected to the motor (131), for controlling rotation of the motor (131).

2. The air intake system of an internal combustion engine (12) according to claim 1,
characterized by a bypass conduit (11b) for diverting air around the supercharger (13).

3. The air intake system of an internal combustion engine (12) of claim 1 or 2,
wherein the rotation of said motor (131) is controlled in response to an output demand to said internal combustion engine (12).

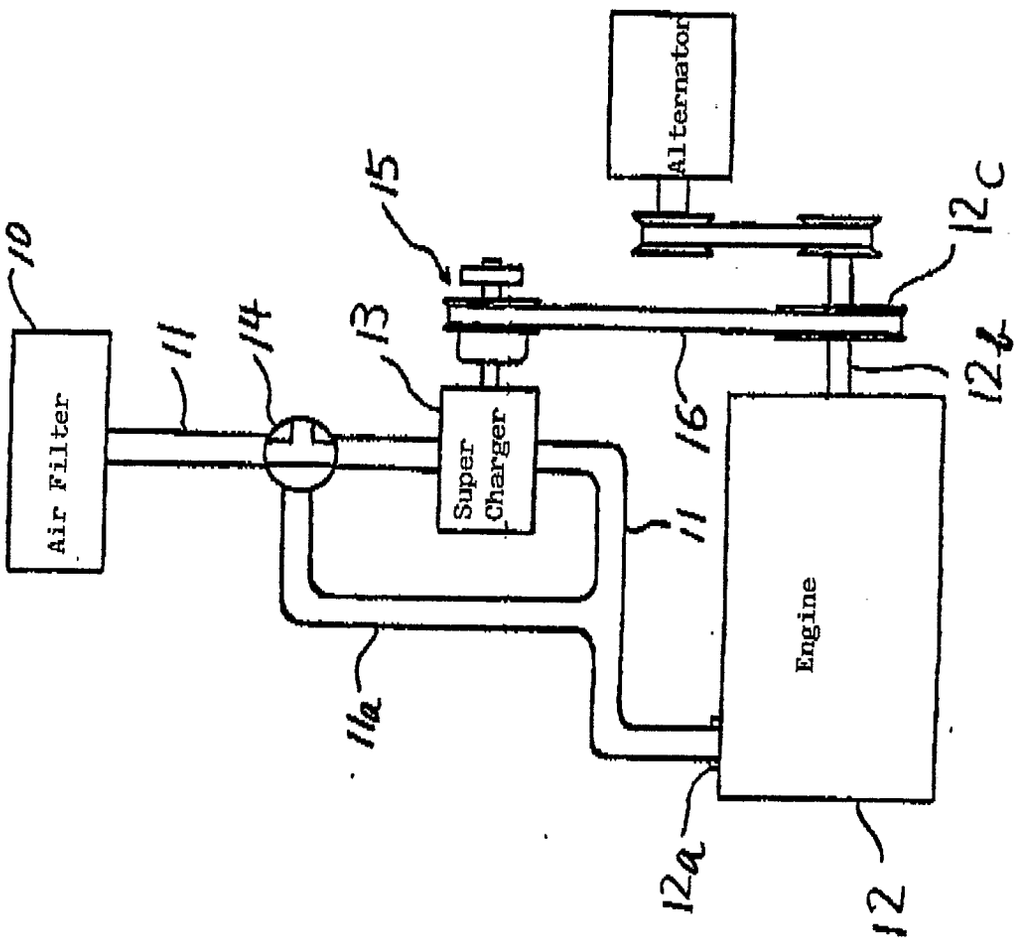
4. The air intake system of an internal combustion engine (12) of one of claims 1 to 3,
wherein said motor rotation controlling means (132) directs the motor (131) to rotate when an electrical signal, supplied to the motor rotation controlling means (132) is equal to or more than a predetermined value.

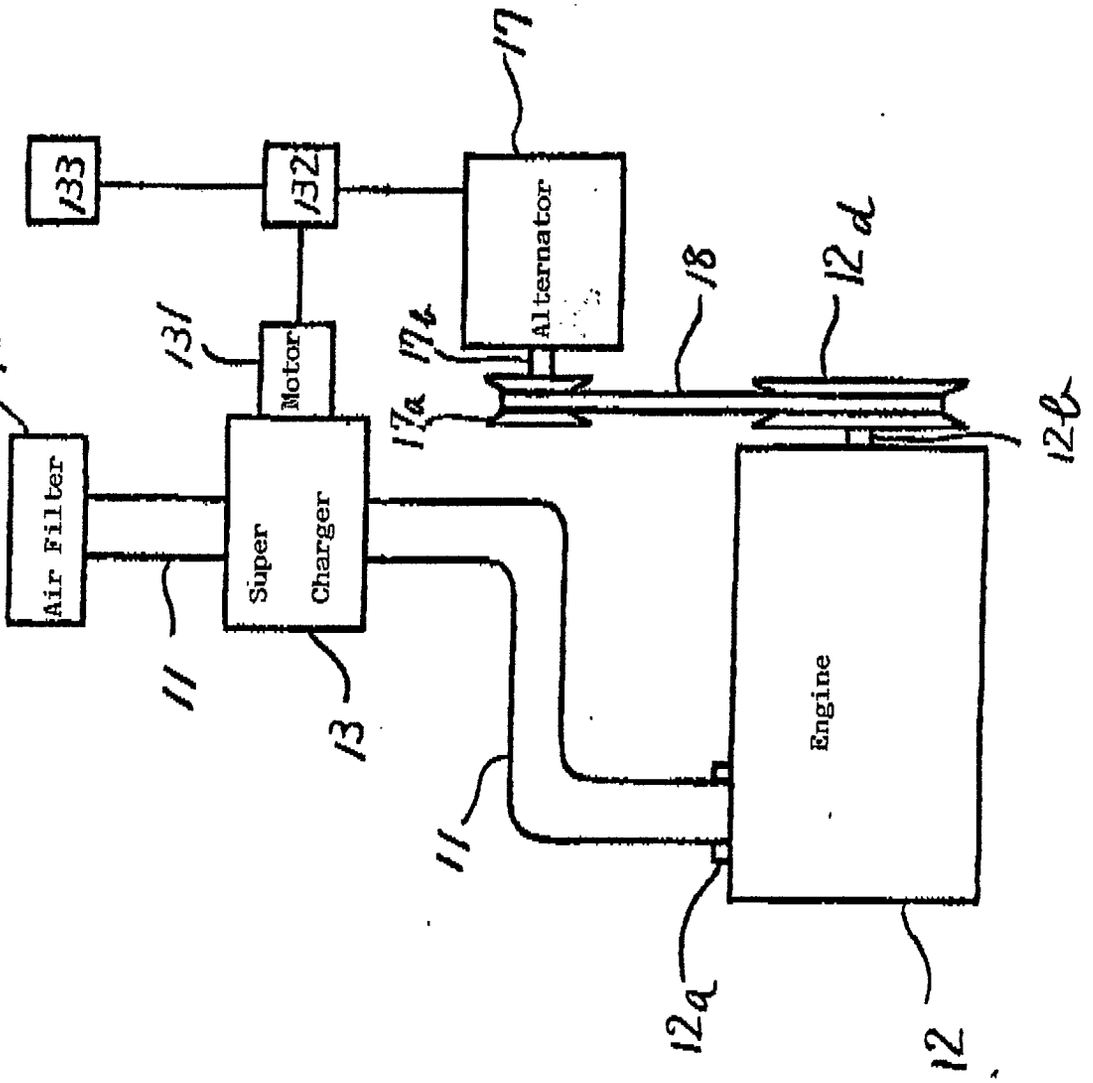
5. The air intake system of an internal combustion engine (12) of one of claims 1 to 4,
characterized by means (133), connected to the motor rotation controlling means (132) for converting an engine output demand to an electrical signal.

6. The air intake system of an internal combustion engine (12) of claim 5,
characterized in that the electrical signal is supplied to the motor rotation controlling means (132).

7. The air intake system of an internal combustion engine (12) of one of claims 1 to 6, characterized by means (133), connected to the motor rotation controlling means (132),for transducing engine output demand to an electrical signal so that the motor (131) drives the supercharger (13) in response to an engine output demand.

Fig. 1


Alternator
15
12c
10
11
14
13
12d
Air Filter
Super Charger
16
11
Engine
11a
12a
12


17
133
132
Alternator
12d
18
131
Motor
17a
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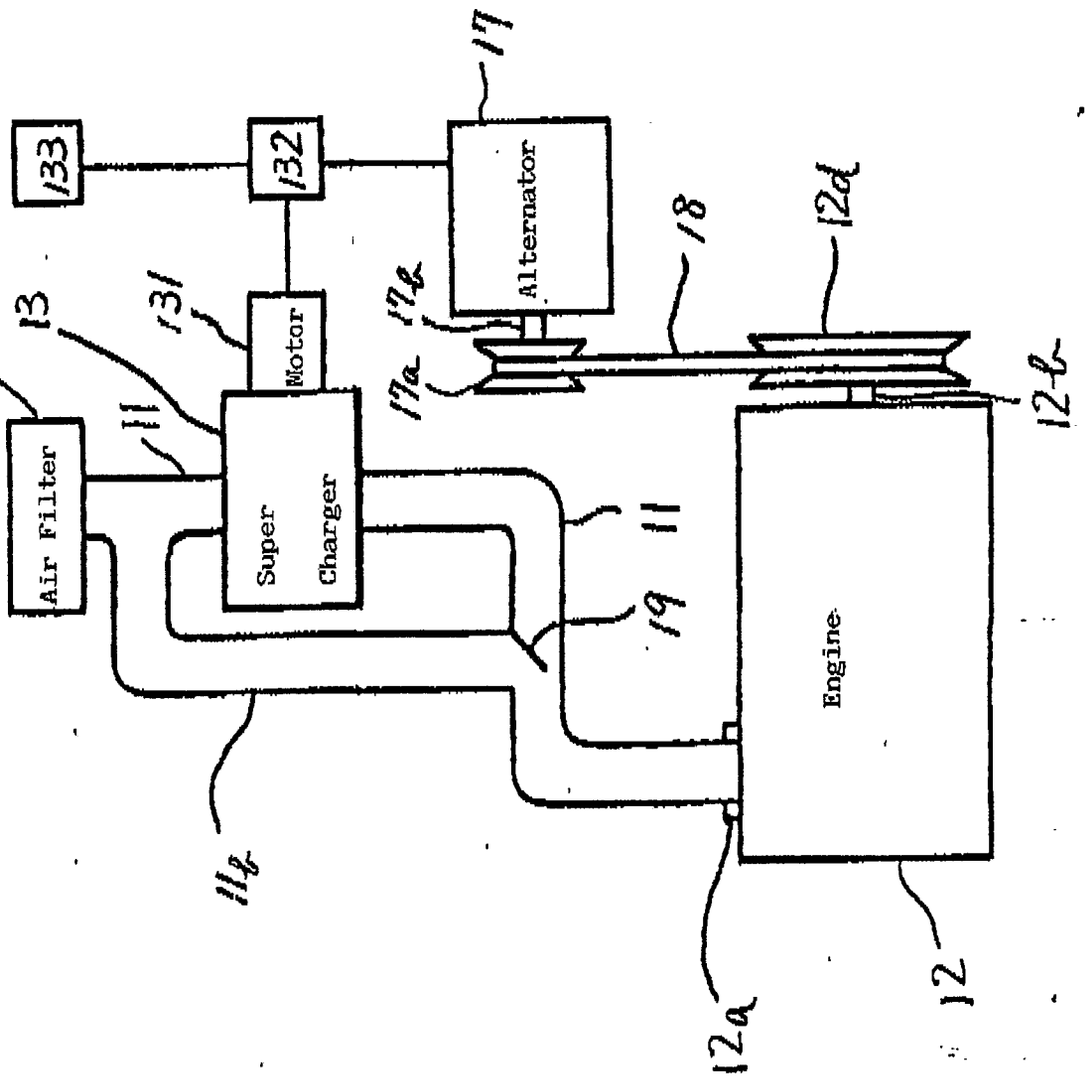
Air Filter
Super Charger
12b
11
13
Engine
12a
12

Fig. 2

Fig. 3


133
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Super
Charger
19
11
12b
Engine
11a
12a
12

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 88 11 7150

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
X	US-A-4 669 269 (DINGER et al.) * column 3, line 17 - column 4, line 61; figure 1 *	1 - 7	F 02 B 39/10
X	GB-A-2 163 483 (SOLEX) * page 1, line 116 - page 2, line 64; figure 1 *	1 - 7	
X	DE-A-2 004 749 (KRAG) * whole document *	1 - 7	
X	FR-A-2 504 992 (VALBREV) * page 5, line 23 - page 7, line 27; figure 1 *	1 - 3	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

F 02 B 39/00

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	30-12-1988	NORDSTROEM U.L.N.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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