

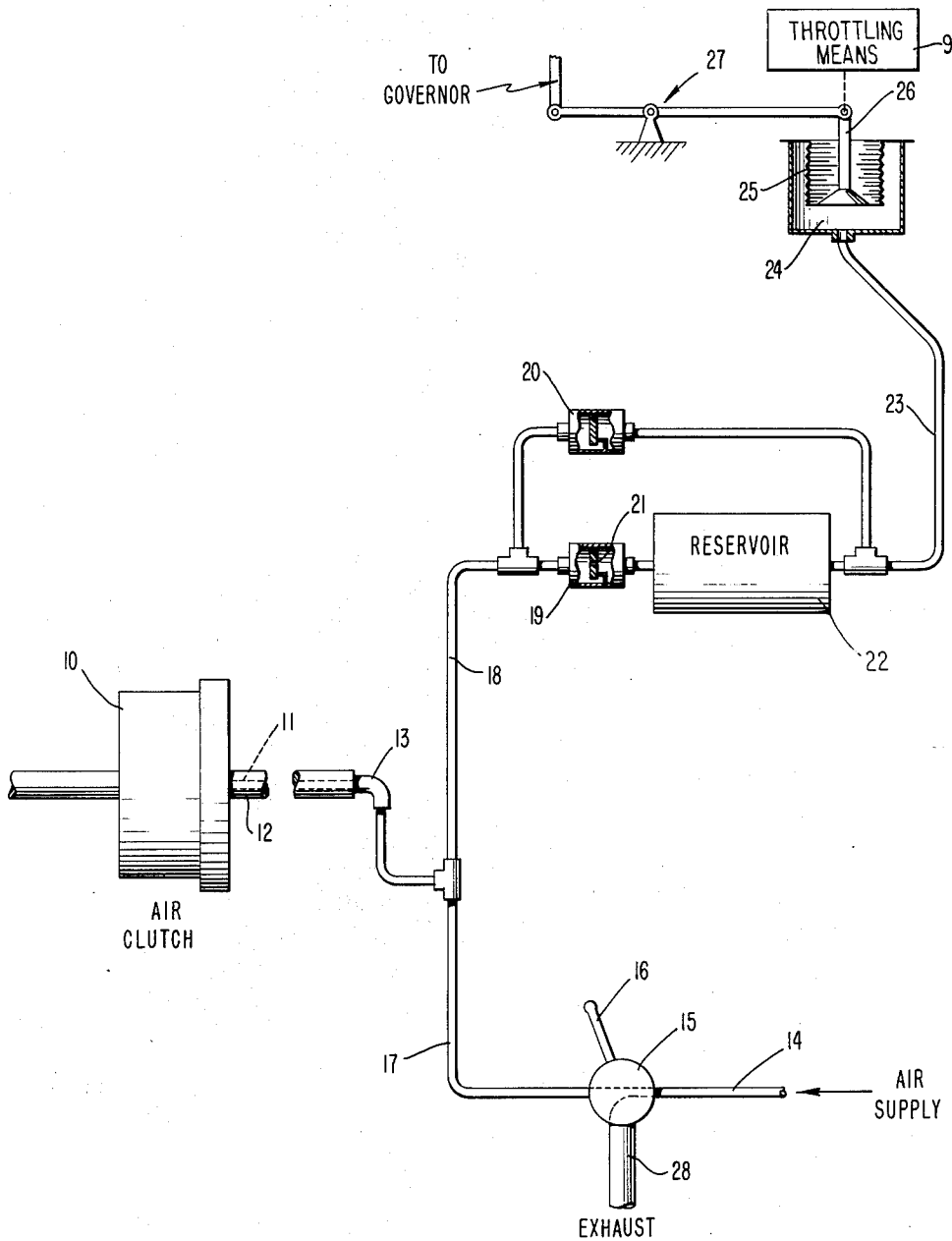
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ACCELERATION CONTROL

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INVENTOR.
PAULSEN SPENCE

BY

Ray C. Hoppard
ATTORNEY

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3,207,277

ACCELERATION CONTROL

Paulsen Spence, Baton Rouge, La.; L. B. Dexter and O. C. Paulsen, co-executors of said Paulsen Spence, deceased, assignors to Spence Engineering Company, Inc., Walden, N.Y., a corporation of New York
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4 Claims. (Cl. 192—,096)

The invention, generally, relates to a control for the throttle of an engine which may be an internal-combustion engine and, more particularly, to a control for limiting engine acceleration, while permitting quick deceleration.

In many applications of prime-mover engines, as when the load is a pump or electric generator, there may be sudden changes in load, as for example, a sudden removal of the loading on the pump (or a declutching of the pump from the engine), producing a sudden tendency of the engine to race. In some of these applications, the load removal is so sudden that racing occurs before the conventional governor mechanism can be effective. Also, in such systems, the sudden application of a load may cause the governor to feed too much fuel to the engine, with resultant tendency to stall. Many arrangements have been developed in the past to limit engine acceleration as load is applied, but none have combined economy with simplicity of manufacture and reliability of operation.

Accordingly, it is an object of the present invention to provide a new and improved throttling or acceleration control for an engine.

It is also an object of the invention to provide an engine throttle control to limit acceleration of the engine to a predetermined rate, yet permitting quick deceleration when load is removed.

It is a specific object to provide an automatic engine-throttle control which is immediately effective to reduce the throttle to idling position as soon as the engine load is removed (e.g., by declutching) and which is also effective to gradually open the throttle when the load is re-applied to the idling engine.

For a more complete understanding of these and other objects of the present invention, reference may be had to the description which follows and to the accompanying drawing, the single figure of which illustrates an air circuit embodying the principles of the invention.

Briefly, in application to an engine and load which are coupled by air-operated clutching means, the invention contemplates an automatic control adapted to be inserted in the air supply circuit between the supply and the throttle or engine-speed control. As air is supplied to operate the air-operated clutch, the rate of application of this control air to the engine speed operator is limited to a predetermined relatively slow rate of build-up of air pressure, for the case of load suddenly applied to an idling engine. For the case of load suddenly removed from a running engine, the same automatic control reduces the throttle to idling position as soon as the load is removed.

Referring now more particularly to the illustration in the drawing, the invention is shown in application to an air-operated clutch 10 which selectively couples an internal-combustion engine (not shown) to a load (not shown) which may be a pump or electric generator or the like. The engine throttling means 9 is shown by legend and, depending upon the application, the throttle control may include a speed governor, such as a flyball governor, also suggested by legend in the drawing.

The air-operated clutch 10 is shown receiving control air pressure through a conduit 11 in a shaft 12 by means of an end connection 13. A suitable air supply is connected to conduit 14, and when a valve 15 is positioned

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appropriately, as by means of a clutch-operating handle 16, the control air supply is connected through conduit 17 and through the connection 13 to operate the air clutch.

At the same time, the control air pressure is connected through conduit 18 to two check valves 19 and 20, which are disposed to check air flow as long as control air pressure is applied to engage the clutch 10. The check valve 19 has a small bleed orifice in the order of $\frac{1}{32}$ inch diameter, by way of example, and is identified by the numeral 21.

Thus, when air is supplied to engage clutch and apply the load to an idling engine, the control air bleeds through the orifice 21 (for a first rate-of-build-up limiter) to slowly fill a reservoir 22. This limited flow delays the build-up of pressure in conduit 23 and in chamber 24 of a pressure-responsive control for the throttling means 9.

As pressure in the chamber 24 builds up, a diaphragm 25 moves upwardly, moving rod 26 upwardly against linkage 27 to operate the throttle to permit an increase in engine speed.

While, first, the size of the orifice 21 and, second, the dimensions of the reservoir 22 control the rate of pressure build-up, it is contemplated that, depending upon the application, as much as 20 seconds may be required to achieve optimum results in build-up of throttle opening.

With the clutch 10 engaged and with the engine running under heavy load, assume that it is desired to disengage the clutch, as by moving the handle 16 clockwise, connecting conduit 17 to an exhaust 28. The clutch 10 will be disengaged promptly.

It then becomes necessary to relieve the pressure in the chamber 24 as quickly as possible to prevent a dangerous increase in engine speed. Accordingly, the check valve 19 will open and permit the pressure in the chamber 24 to be dumped through the exhaust connection 28.

As a further assurance that the throttle will be reduced to idle position as soon as the load is removed, the second check valve 20 may be connected in parallel across the check valve 19 and the reservoir 22; this by-pass connection will be understood as a safety precaution, which may not be essential in every instance. In other words, with the valve 20, shown in the drawing, the chamber 24 will be exhausted even if the check valve 19 is temporarily inoperative for any reason.

With a circuit arrangement to control the rate of engine acceleration as described above, a relatively wide range of control as well as a relatively accurate control can be obtained. For example, the diameter of the orifice 21 is controllable to an accurate degree, and the size of the reservoir 22 is also adaptable to accurate control.

In addition, control air supply bleeding through the orifice 21 permits an accurate predetermination of rate of pressure build-up, and the size of the reservoir 22 permits an accurate control of the length of time to achieve a predetermined pressure. A combination of the orifice 21 and the reservoir 22 permits a highly reliable engine acceleration control arrangement, with the feature of instantaneous reduction to idling conditions upon removal of the load, and regardless of response delays that may be inherent in the governor system.

The foregoing description is directed solely to the construction illustrated, but I desire it to be understood that I reserve the privilege of resorting to all the mechanical changes to which the device is susceptible, the invention being designed and limited only by the terms of the appended claims.

What is claimed is:

1. In combination, clutching means for connecting and disconnecting an internal-combustion engine to and from a load,

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said clutching means including first fluid-pressure responsive operating means,
 a source of fluid pressure and a control coupled to said operating means for determining the engaged or disengaged condition of said clutching means,
 engine-throttling means including second fluid-pressure responsive operating means,
 connecting means coupling said source and control to said second fluid-pressure responsive means, including delay-operated means producing a delay in opening of said throttling means upon actuation of said clutching means to engaged position,
 said connecting means further including flow control means permitting substantially unimpeded exhausting fluid flow in a first direction and substantially impeded flow in a second direction to exhaust said second fluid-pressure responsive operating means upon removal of control pressure from said first fluid-pressure responsive means.

2. In combination,
 clutching means for connecting and disconnecting an internal-combustion engine to and from a load,
 said clutching means including clutch-actuating means, engine-throttling means including throttle-actuating means,
 first flow control means interconnecting said clutch-actuating means and said throttle-actuating means for synchronizing a declutching operation with a throttle reduction to an idling condition,
 and second flow control means connecting said clutch-actuating means to said throttle-actuating means, said last-defined means including delay means, whereby upon operation of said clutching means to engaged

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position said delay means will be effective to operate said throttle-actuating means to open condition only at the relatively slow rate determined by said delay means.

3. In combination,
 clutching means for connecting and disconnecting a prime-mover engine to and from a load,
 said clutching means including clutch-actuating means including exhaust means,
 engine-throttling means including throttle-actuating means,
 flow control means interconnecting said clutch-actuating means and said throttle-actuating means for synchronizing a declutching operation with a throttle reduction to an idling condition,
 said fluid control means including relatively slow acting throttle-opening means,
 said flow control means providing unimpeded flow when said exhaust means is open.

4. The combination of claim 3 in which said flow control means comprises a check valve and fluid reservoir coupled in series.

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DON A. WAITE, *Primary Examiner.*BROUGHTON G. DURHAM, *Examiner.*