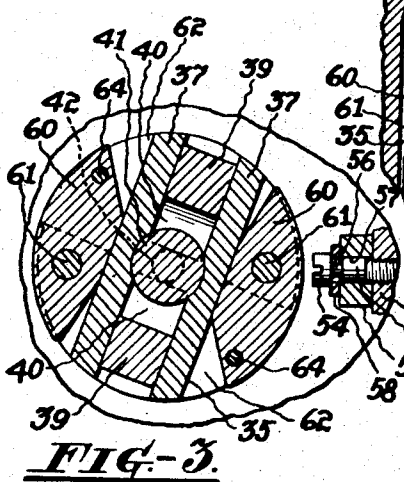
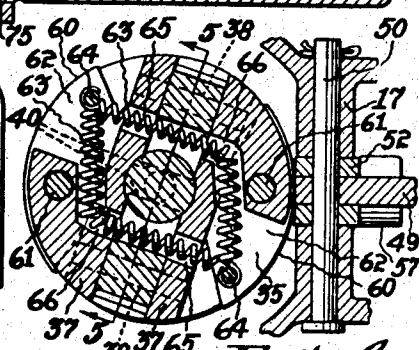


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SPEED RESPONSIVE FLUID MOTOR THROTTLING
AND SHUT-OFF VALVE MEANS
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SPEED RESPONSIVE FLUID MOTOR
THROTTLING AND SHUTOFF VALVE
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2 Claims. (Cl. 121-34)

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This invention relates to governors, and more particularly to a safety device for shutting down a fluid actuated motor when it overspeeds due to malfunctioning of the governor.

An object of the invention is to provide a governor which in response to overspeeding of the motor will be caused to be disengaged to permit or cause a valve to close automatically to shut down the motor.

This invention is particularly adaptable to pneumatic tools such as grinders and the like, which are apt to run at frequent intervals without load, at which time the motor runs substantially free and would readily overspeed if not properly controlled by the governor. Governors in such tools come into play very often so that their pivots wear, the throttle valve may wear to provide very considerable clearance and other conditions may contribute to let the governor get out of order. In the case of grinders, overspeeding is dangerous because they operate normally at speeds as high as safety regulations permit. Excessive overspeeding may result in breakage of the grinding wheel by centrifugal action.

This invention provides a means for closing a valve or permitting it to close when the motor overspeeds in such a way that it cannot be restarted without taking the tool apart.

The invention will be more clearly understood and other objects and advantages will become apparent by reference to the accompanying drawings in which similar reference characters refer to similar parts, and in which

Fig. 1 is a longitudinal vertical section through a portable grinder of the pneumatic type, provided with a governor constructed in accordance with the practice of the invention,

Fig. 2 is a longitudinal vertical section through the centrifugally operated elements of the governor, showing more particularly the arm or walking-beam for transferring motion to the throttle valve, and its internal construction,

Fig. 3 is a cross-section through parts of the governor, taken along the line 3-3 of Fig. 2 looking in the direction of the arrows,

Fig. 4 is a section taken along the line 4-4 of Fig. 1, looking in the direction of the arrows, showing more particularly the breaker elements, and

Fig. 5 is a section taken along the lines 5-5 of Fig. 4 looking in the direction of the arrows.

Referring to the drawings, the invention is shown as applied to a pneumatic tool commonly known as a surface grinder, which is adapted to rotate a grinding wheel 10 mounted on a main

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motor spindle 11. The motor which the governor is adapted to control is of the rotary vane type, and comprises a rotor 12 having suitable vanes 13 and rotatable within the cylinder 14. A front end plate 15 is provided for the cylinder 14 and also a backhead 16. The motor is suitably housed in a casing 17 having a head 18 bolted thereto which supports the guard 19 surrounding the grinding wheel 10.

Motive fluid for operating the motor is introduced through a handle 20 formed integrally with the casing 17 and hollow to form a fluid conducting passageway 21. The main or manually operated valve 22 controls the flow of motive fluid from this passageway to a valve chamber 23.

Conventional exhaust ports 80 are provided in the cylinder 14 communicating with atmosphere by way of apertures 81 in the casing 17.

Within the chamber 23 are contained the various elements of the governor operated throttle valve which include a bushing 24 having a bore 25 provided with a port 26 leading by way of a passage 27 to the inlet ports 28 in the cylinder 14. The bore 25 of the valve bushing is adapted to receive the piston-like portion 29 of the throttle valve which is adapted normally to overrun the port 26 more or less to throttle the supply of motive fluid to the motor. The piston-like portion 29 is provided with a stem 30 extending through a bore 31 of the bushing 24.

The throttle valve is adapted to be actuated by a speed-responsive element or mechanism mounted on the rotor 12 and preferably centrifugally operated. In this instance this mechanism comprises a support 35 having a stem 36 by which it is screwed into the rotor 12 and provided with a pair of parallel walls 37, bearing pivots 38 upon which are supported the fly-weights 39. Each of the fly-weights 39 is provided with an inwardly extending arm 40 which rises as the weights move outwardly under the influence of the centrifugal force. The arms 40 are adapted to engage the underside of a head 41 mounted upon a rod 42 extending into the rotor 12 (Fig. 1). Normally, the rod 42 is held down by the pressure of a spring 44 around the rod and bearing against the stem 36. The compression of the spring 44 may be regulated by means of a nut 45 on the stem 42.

Motion of the head 41 is transmitted to the stem 30 of the throttle valve by means of a lever member consisting in this instance, of two sections, 48, and 49, each pivotally mounted upon a transverse shaft or pin 50 carried by the casing 17. They are normally connected together at

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a pair of adjacent projections 51 and 52, respectively, by means of a connecting member, in this instance a screw 53, having a head 54 projecting toward the frame or support 35. The screw 53 is adapted to be broken so as to disconnect the members 48 and 49 and for this purpose the screw is necked down as shown at 56, just under the head 54. The aperture 57 in the projection 52, through which the screw 53 is adapted to pass, is preferably large, so that when broken the screw 53 cannot interfere with the motion of the arms 48 and 49 with respect to each other. To span the aperture 57 a washer 58 is provided under the head of the screw.

As has been intimated above, the fly-weights 39 may under some circumstances become unreliable in their action, and accordingly the means for breaking the screw 53 is independent of the fly-weights 39. To this end, are provided a pair of weights 60 diametrically disposed with respect to the axis of the frame 35 and adapted to oscillate on pivots 61 extending generally longitudinally with respect to the rod 42. The frame 35 is provided with slots 62 to guide the weights 60.

At normal speeds, the weights 60 are restrained from flying outwardly by a pair of springs 63 attached at their ends to pins 64 mounted on the heavier ends of the weights 60. In order not to interfere with the action of the fly-weights 39 the springs pass through apertures 65 and 66 in the walls 37, adjacent a cutaway portion of the fly-weights 39.

The governor is housed within the casing 17, access into the interior, however, being provided by an aperture 70 provided adjacent the portions 48 and 49 of the lever or walking-beam. The aperture 70 may be provided with a cover (not shown) of a suitable description.

Normally, the piston portion 29 of the throttle valve controls the flow of motive fluid through the port 26. However, a further valve is provided by a head 75 mounted on the stem 76 extending longitudinally of the valve bushing 24. The valve head 75 is adapted to seat on the beveled end 77 of the valve bushing 24. A suitable biasing spring 78 contained in a plug 79 in the end plate 18 presses against the head of the valve 75 and tends to press the valve in the closed position.

In operation at light or no load, rotation of the rotor 12 causes the fly-weights 39 to fly out against the pressure of the spring 44 and to raise the head 41 of the rod 42. This motion is transmitted through the walking-beam, consisting of the arm sections 48 and 49, to the stem 30 causing the piston valve 29 to partially close the inlet port 26. As will be understood by those skilled in the art, this governor action adjusts itself so that the speed of the motor is normally kept within desired limits. However, if by reason of wear of the valve bushing 24 or for any other reason the governor does not properly control the speed of the rotor 12, then the weights 60 fly out, overcoming the tension in the springs 63 and, at a sufficient speed and centrifugal force, they will strike the head 54 of the screw 53 breaking it, whereupon the arms 48 and 49 collapse, permitting the spring 78 to press the valve

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head 75 to its seat 77. This completely shuts off the supply of motive fluid to the motor, which then stops.

In case of omission or failure of spring 78, air flow and pressure will act to close the poppet valve 75.

In this construction the machine must then be taken apart to reset and the trouble ascertained. In any event, the motor cannot be operated higher than a predetermined speed.

Thus by the above construction are accomplished among others, the advantages hereinbefore referred to.

I claim:

1. A governor for a fluid actuated motor having a speed responsive element actuated by the motor, a reciprocatory throttle valve for normally controlling the supply of motive fluid to the motor, a valve movable with the throttle valve adapted to shut off the supply of motive fluid to said motor, a member formed in sections normally connected together to transmit motion from said element to said valves and to hold the second mentioned valve in the open position, a centrifugally operated breaker mounted with said element and responsive to the speed of said motor, a connecting element for said sections adapted to be fractured by said breaker for rendering the member ineffective to actuate the valves, and a spring for moving the second mentioned valve to its closed position whenever the connecting element becomes fractured by the breaker.

2. A governor for a fluid actuated motor having a speed responsive element actuated by the motor, a reciprocatory throttle valve for normally controlling the supply of motive fluid to the motor, a valve movable with the throttle valve adapted to shut off the supply of motive fluid to said motor, a member to transmit motion from said element to the valves and normally hold the second mentioned valve in position to permit the flow of motive fluid to the motor, said member having a plurality of sections normally connected together, a pivot on which said sections are individually mounted for oscillation, a connecting element to hold said member sections together, a centrifugally operated breaker mounted on said speed responsive element to fracture said connecting element for rendering the member ineffective to actuate the valves, and a spring acting against the valves in opposition to the said member to move the second mentioned valve to its closed position whenever the connecting element becomes fractured by the breaker.

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