

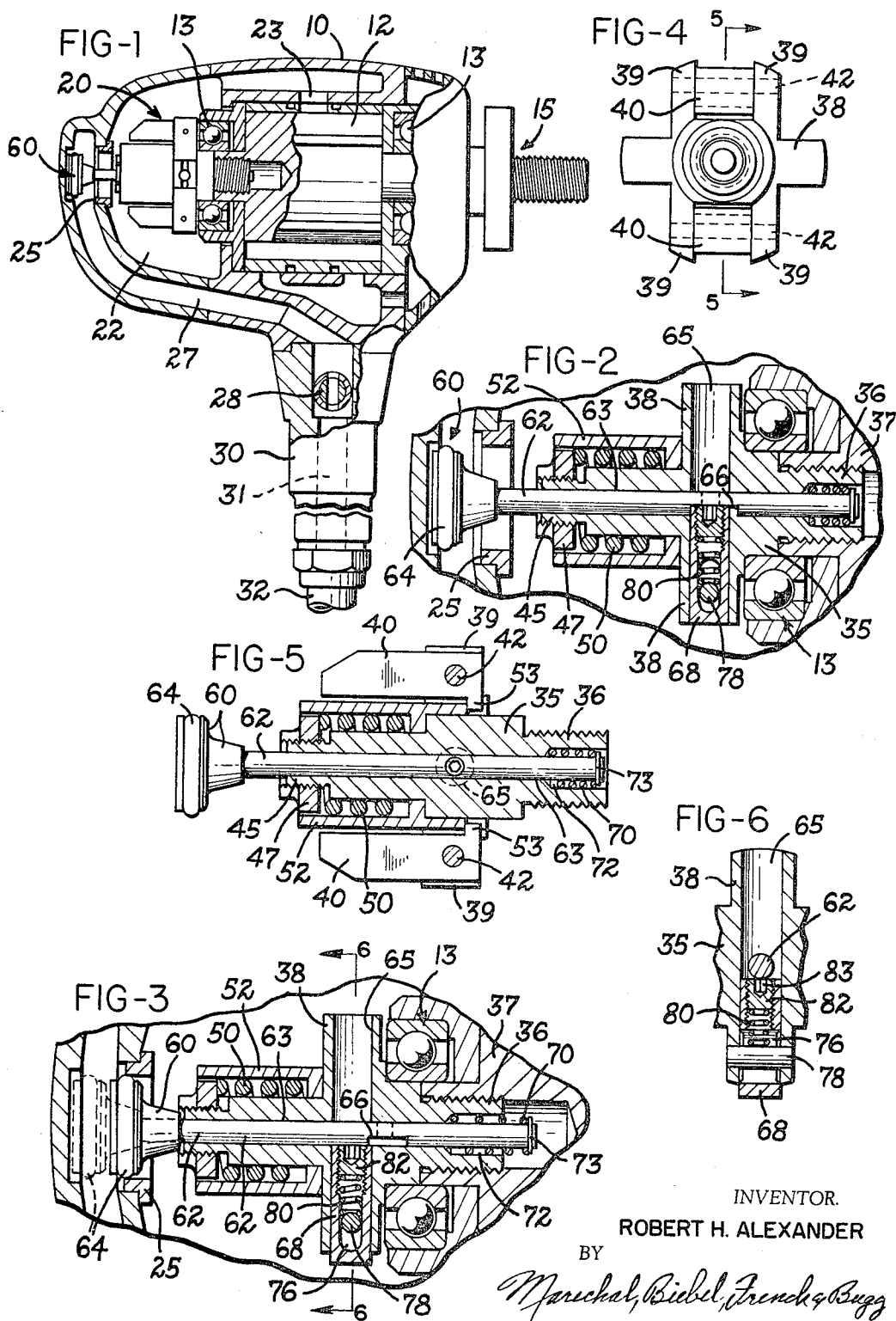
Oct. 18, 1966

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3,279,485

SAFETY GOVERNOR FOR PNEUMATIC TOOL

Filed April 22, 1963



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3,279,485

**SAFETY GOVERNOR FOR PNEUMATIC TOOL**  
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Filed Apr. 22, 1963, Ser. No. 274,510

4 Claims. (Cl. 137—50)

This invention relates to pneumatic tools having a rotary drive, particularly to such tools used as grinders or the like, and wherein a governor, usually centrifugally operated, controls the speed of the motor.

In such tools, particularly when used to rotate grinding wheels, it is desirable to prevent overspeeding of the rotary motor. This might occur, for example, if there was a malfunction of the governor mechanism, as can occur due to dirt, wear, or some other reason which causes the governor to stick. When these devices overspeed it is possible quickly to exceed the safe speed of rotation of the grinding wheel, and as a result centrifugal force will cause the wheel to disintegrate, with obvious dangerous results.

The present invention provides a novel safety governor mechanism which comes into operation only in the event that the rotary motor exceeds the speed range under which it normally operates due to the regular governor control. If such excessive speed occurs, the present invention provides a quick-acting safety governor mechanism which will immediately cut off the air flow to the motor, or in any event at least so greatly impede this air flow that the motor will be stopped or slowed too far below its operating speed, thereby avoiding the undesirable and dangerous conditions as mentioned previously.

Accordingly, the primary object of this invention is to provide a safety governor mechanism for a pneumatic tool having a rotary motor, and in which the driving fluid to the motor enters through an inlet port, wherein a safety valve member is mounted upstream of such port with respect to the motor, and is held in this position by a latch which in turn holds the valve against the bias of a spring or equivalent device urging the safety valve toward the port to block passage of motive fluid through it, and wherein an adjustable centrifugally operated safety release device is connected to the latch for releasing it in response to overspeeding of the motor.

Another object of the invention is to provide such a safety governor construction which may be adjusted to release the latch at a predetermined speed which is in excess of the normal governed speed range of the tool.

A further object of the invention is to provide such a safety governor construction wherein the parts including the latch, its biasing or valve-closing means, and the centrifugally operated safety release, can all be incorporated within the regular governor mechanism, and can be applied to the tool as a part of the governor device.

Another object of the invention is to provide a novel safety governor mechanism which is of simple and relatively inexpensive construction, but which is reliable in its operation such that it will avoid overspeeding of the motor even though it may be called upon to function in this manner only upon rare occasions.

Other objects and advantages of the invention will be apparent from the following description, the accompanying drawing and the appended claims.

In the drawing—

FIG. 1 is a view, primarily in section and with some parts broken away, taken through a typical pneumatic tool of the type, showing the governor mechanism and the safety governor construction in its general relation to the other parts of the tool;

FIG. 2 is a substantially enlarged longitudinal section

view taken through the governor and the safety governor mechanism incorporated therein;

FIG. 3 is a view similar to FIG. 2, but with the parts moved to illustrate the closed position of the safety valve, which it attains upon functioning of the safety governor mechanism;

FIG. 4 is an end view of the governor mechanism per se, as seen from the end thereof attached to the motor shaft;

FIG. 5 is a sectional view taken on line 5—5 of FIG. 4; and

FIG. 6 is a detail view, taken on the line 6—6 of FIG. 3, showing portions of the latch mechanism of the safety governor in the released position thereof.

Referring to the drawing, which illustrates a preferred embodiment of the present invention, a typical pneumatic rotary grinding machine of the portable type is shown as including a main body or housing 10 within which there is a conventional rotary pneumatic motor 12, of the slidable vane type, and which has its output shafts or ends mounted in bearings 13 fore and aft of the main body. The forward portion of the shaft extends outwardly of the body and provides an arbor indicated generally at 15 upon which a grinding or abrasive wheel, or some other rotary tool, is to be mounted. On the rear of the motor shaft, behind the aft bearing 13, there is mounted the governor mechanism, shown generally at 20, and housed within the motor air plenum chamber 22. Air from this chamber passes through the inlet opening 23 in the housing to the motor 12. Air is admitted to the chamber through an inlet port, shown as an inserted port member 25.

This air is received through a supply passage 27 which leads from a manually operable valve 28 carried in the usual manner within the handle 30 of the tool. This handle is likewise provided with an inlet passage upstream of the valve, and motive fluid such as air under pressure is supplied through the hose or tube 32 coupled to the handle.

The governor mechanism, particularly with reference to FIG. 2, includes a main body 35 having a threaded stem 36 which is threaded into the rear or aft end of the rotor portion of the motor, a segment thereof being shown at 37. The governor body includes radially extending arm portions 38, which are hollow, and, displaced approximately 90° from these arms, radially extending flyweight support arms 39 which are shown in FIGS. 4 and 5.

Between these flyweight support arms there are centrifugally responsive governor weights 40, each of which is mounted for pivotal movement on a pin or rod 42 extending between adjacent arms 39.

The rearward portion of the body 35 terminates in a threaded end 45 of reduced size, and a spring stop 47 is fastened thereon. Abutting this stop is the main governor spring 50 which acts between the stop and the cylindrical governor valve member 52. This valve member has appropriate slots therein to pass around the arms 38, and to pass between the arms 39, whereby the inwardly extending tips 53 of the weights 40 are arranged to press against the valve 52, and to urge it toward the inlet port 25 against the force of spring 50. In other words, this is a more or less conventional type of proximity governor apparatus, another form of which is shown in the patent to Conklin et al., No. 2,925,089 issued February 16, 1960, and presently assigned to the same assignee as this application.

The safety governor mechanism, which is the feature of the present invention, includes a safety valve member 60, fixed to the end of a rod or shaft 62 which is in turn mounted for sliding movement in a longitudinal bore or passage 63 formed in the main governor body 35. Pre-

ferably, the valve member 60 includes a compressible seal such as an O-ring 64 carried about its periphery to assure a good cut-off action between this valve and the inlet port 25. It should be understood, however, that this seal is unnecessary, and in fact a complete closing of the port is not essential, so long as the safety valve member is of sufficient size to provide an effective throttling of the flow of motive fluid to such an extent that the motor cannot operate at its normal speed.

The portion of the rod 62 which extends across the passage or opening 65 through the arms 38 is provided with a slot or similar recess 66. This recess cooperates with a latching slide 68 to form the releasable latch mechanism normally operating to hold the valve 60 in an open position, upstream of the port 25. The valve is preferably urged toward its closed position, as shown in FIG. 3, by spring 70 which acts between the base of a counter-bore 72 in the threaded forward end 36 of the governor body, and a snap ring 73 or equivalent carried on the forward end of the rod 62. It will be obvious from inspection of the drawings and comparison of FIGS. 2 and 3, that when the latching slide 68 is moved radially outward to disengage from the slot 66, spring 70 will tend to carry the valve 60 into a closed position with respect to the inlet port 25.

The slide 68 constitutes a safety flyweight, which can move radially within that one of the arms 38 in which it is mounted. The slide is hollow, and the side walls thereof are provided with transversely aligned slots 76, as shown in FIG. 6, to permit passage of an anchor pin 78 which will define the position of the slide without interfering with its sliding motion. A spring 80 is positioned within slide 68, and abuts at one end the pin 78, and at the other end a threaded set screw 82. This screw can be adjusted, for example by insertion of a suitable wrench within the socket 83 in its head, to adjust the loading of spring 80 in its normal position.

As previously mentioned, the parts during normal operation are in the position shown in FIG. 2. The slide 68 is engaged within slot 66 thereby holding the safety valve member 60 in open position against the urging of spring 70 and the force of the pressure air flowing into the port 25. If for some reason the main governor mechanism does not work and the motor overspeeds, the resultant centrifugal force acting on the slide 68 will be sufficient to overcome the force of spring 80, which has been appropriately preset, and the slide will move radially outward to release the valve rod or stem 62, whereupon it will be urged to the right as shown in FIG. 3 carrying the valve 60 into the inlet port 25.

It should be noted that this action is in conjunction with the normal flow of air from passage 27 into and through the port 25, and it has been found that this flow in itself is sufficient to cause the closing movement of the safety valve member. However, the spring 70 is desirable from a safety standpoint. Once the rod 62 has moved to carry the notch 66 beyond the slide 68, approximately to the position shown in FIG. 3, the tool will no longer operate, since air flow through port 25 will be blocked, either cut off or so severely limited that an adequate volume of air will not be available to the motor, even for limited operation. As a result the operator will be unable to use the tool, and in order to reset the safety governor mechanism, it is necessary to dismantle the tool and correct the condition, whatever it may be, that caused malfunctioning of the governor.

It will be obvious from the foregoing description and the drawing, that the present invention provides a novel and effective safety governor construction which is of simple design, easily manufactured, and which is incorporated into present types of governor constructions whereby this unit may be employed in new types of tools, and may also be adapted with little modification to existing tools, since the only additional space occupied by the present

mechanism (as compared to earlier governor types) is that space required for the valve head 60 in its normal open position on the upstream side of the inlet port.

While the method and form of apparatus herein described constitutes a preferred embodiment of the invention, it is to be understood that the invention is not limited to this precise method and form of apparatus, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. A safety governor for a rotary fluid motor including means forming an inlet passage through which pressure fluid is supplied to drive the motor, means defining an inlet port in said passage, a centrifugally operated rotatably driven governor including a valve cooperating with said port to control the flow of fluid through said port in relation to the rotational speed of said governor, a safety valve member, means mounting said valve member in said passage upstream of said port including a latch holding said valve member normally spaced from said port against the flow of pressure fluid entering said port, and a centrifugally operated safety release mechanism rotatably driven with said governor and operatively connected to said latch to release the same in response to overspeeding causing said safety valve member to move toward said port to block the passage of fluid through said port.

2. A safety governor for a rotary fluid motor including means forming an inlet passage through which pressure fluid is supplied to drive the motor, means defining an inlet port in said passage, a centrifugally operated rotatably driven proximity governor including a valve downstream of and cooperating with said port to limit the flow of fluid through said port to maintain a predetermined operating range of rotational speeds, a safety valve member, means mounting said valve member upstream of said port and normally spaced from said port, means operative on said safety valve member urging it toward said port to impede the passage of fluid through said port, and a centrifugally operated safety release mechanism operatively connected to said safety valve member to release the same in response to overspeeding.

3. Apparatus as defined in claim 2, wherein said governor includes a rotatable body driven by the motor and mounted coaxially of said inlet port, said safety valve member including a rod slidably mounted in said body and extending through said port, a valve head on said rod normally positioned on the opposite side of said port from said body and spaced from said port to permit free inflow of air toward said governor, a normally compressed spring acting on said rod tending to move said valve head toward said port, and wherein said release mechanism includes as auxiliary flyweight carried by said body and engaging said rod to hold said valve head in its normal open position against said spring.

4. A safety governor for a rotary fluid motor including means forming an inlet passage through which pressure fluid is supplied to drive the motor, means defining an inlet port in said passage, a centrifugally operated rotatably driven governor including a proximity valve cooperating with said port downstream thereof to control the flow of fluid through said port in relation to the rotational speed of the motor, a safety valve member, means providing a slidable mounting for said safety valve member including a latch holding said valve member normally spaced upstream from said port, an adjustable centrifugally operated safety release mechanism operatively connected to said latch to release the same in response to overspeeding, and means operative against said latch urging said safety valve member toward said port to block the passage of fluid through said port upon release of said latch.

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