April 6, 1954 N. T. KARLÉN 2,674,229

SPEED LIMITING GOVERNOR FOR FLUID DRIVEN ROTARY DEVICES

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Fig. 1

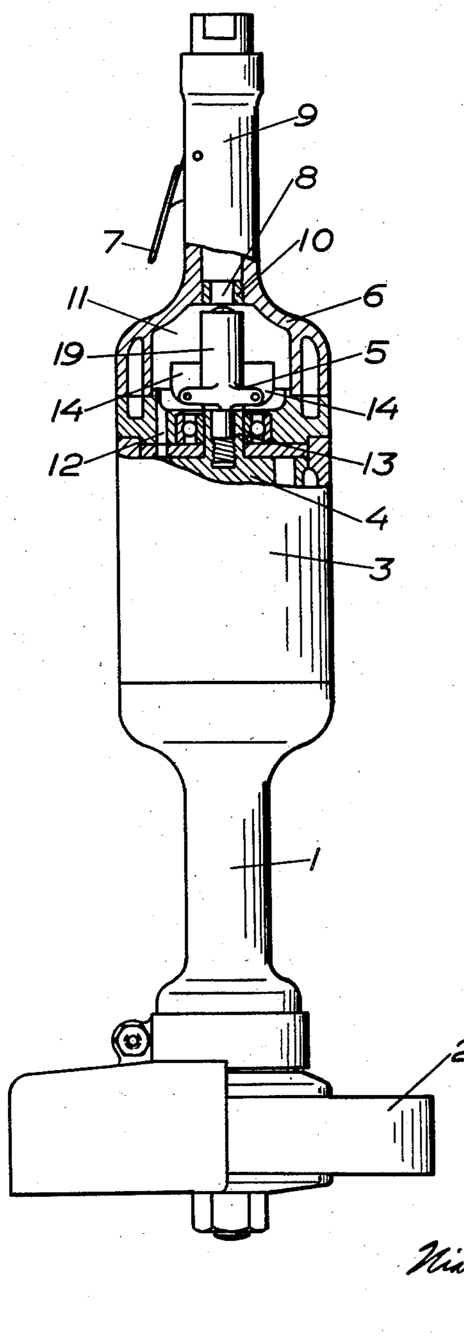

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Fig. 4

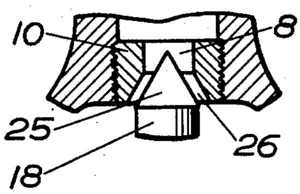


Fig. 3

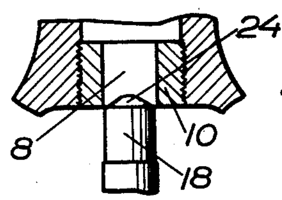
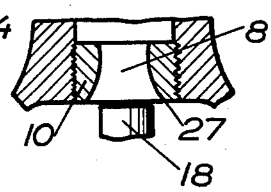


Fig. 5



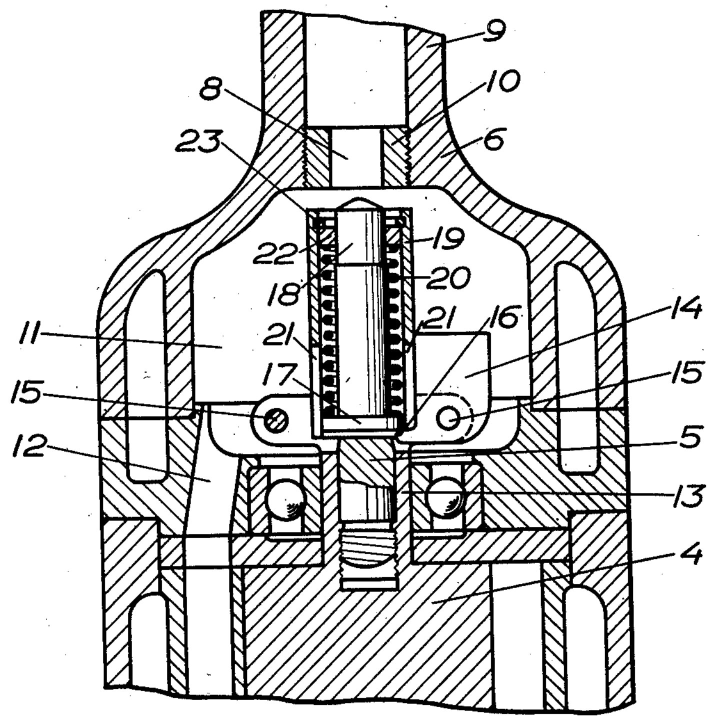


Fig. 2

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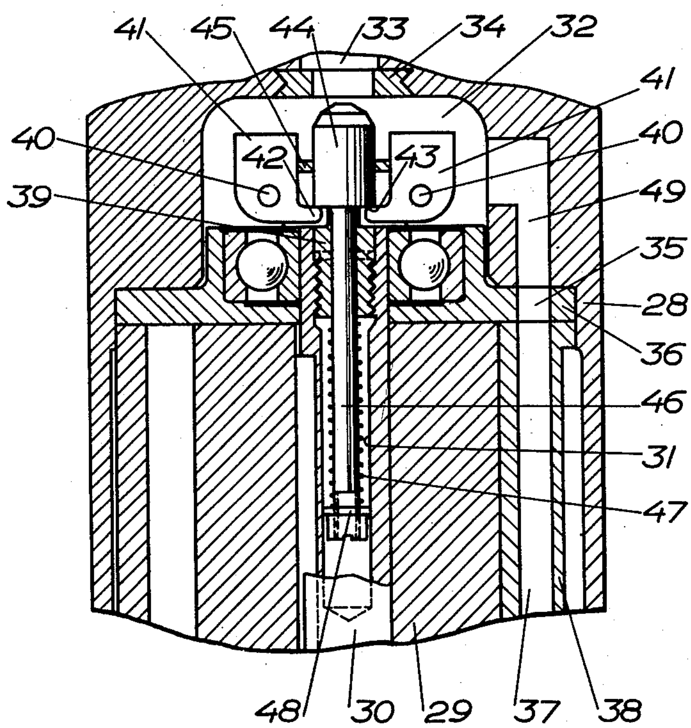
Fig. 6



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SPEED LIMITING GOVERNOR FOR FLUID DRIVEN ROTARY DEVICES

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8 Claims. (Cl. 121—34)

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The present invention relates to speed governors for machines driven by a working fluid flowing through a passage controlled by a rotating valve member. Governors of this type known so far have proved non-reliable on several grounds. For instance, the rotating valve members may seize the stationary parts with which the valve members cooperate due to lack of lubrication or intruding foreign particles or the like. It has then been experienced that the governor is likely to stop in open position of the valve member so that the machine speeds when the load disappears. It has also proved difficult to make all governors alike, since their operation has depended on the manufacturing tolerances of the valve member and cooperating parts. According to the invention the rotating valve member is mechanically driven by the machine and arranged for operation without frictional contact with the walls of the passage and other stationary parts of the machine. The valve member may control the flow of working fluid through the passage by moving into the passage upon an increase of the speed of the machine and by moving away from the passage upon a reduction of the speed of the machine, said movements being produced by means reacting to the speed of the machine. By the above arrangement the risk of failure of the governor due to small particles carried along by the working fluid or due to insufficient lubrication is completely eliminated. Due to the design of the governor its operation is not materially affected by wear. Furthermore, the operation of the governor is only to a very small degree dependent on manufacturing tolerances, and the governor may easily be carried out as a complete unit which may be assembled as such in the machine.

In the accompanying drawings two embodiments of governors according to the invention built into compressed air driven machines are illustrated by way of example. Fig. 1 is a side view of a grinding machine with the governor arrangement in section and the governor in elevation in open position. Fig. 2 illustrates the governor portion of the machine on a larger scale with the governor in section and one centrifugal weight removed. Fig. 3 shows a portion of the valve member of the governor according to Figs. 1 and 2 and the cooperating parts of the machine in nearly closed position of the valve member. Figs. 4 and 5 show different modifications of the valve member and the cooperating parts. Fig. 6 is an axial section of a portion of a machine provided with a governor according to another embodiment of the invention.

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The governor illustrated in Figs. 1, 2 and 3 serves as an overspeed governor for a compressed air driven grinding machine 1 having a grinding wheel 2 driven by an air motor 3 the rotor 4 of which carries the governor 5. Said governor is disposed in a casing 6 forming an admission chamber for the air motor 3 which is supplied with compressed air over a main valve (not illustrated) controlled by a lever 7 and, furthermore, through a passage 8 formed in a bushing 10 screwed into the handle 9 of the machine. From the admission chamber 11 in the casing 6 the air is conducted to the air motor of the machine through ducts 12.

The governor 5 is a centrifugal governor the shaft of which is screwed into a bore in the shaft 13 of the rotor 4. The governor is provided with centrifugal weights 14 journalled on pins 15 carried by the governor body. The weights engage by means of fingers 16 the lower side of a flange 17 on a plunger type valve member 18. A sleeve 19 carried by the governor body encloses the valve member 18 and a spring 20 acting on the flange 17 and counteracting the force exerted by the centrifugal weights 14 on the valve member. The sleeve 19 is rigidly secured to the governor body and the fingers 16 of the centrifugal weights 14 extend through slots 21 in the walls of the sleeve. A washer 22 and a retaining ring 23 in the sleeve 19 form a support for the upper end of the spring 20. The valve member 18 is movable towards the passage 8 in the bushing 10 and more or less restricts said passage when the centrifugal weights are thrown outwardly. In Fig. 3 the valve member 18 is illustrated in a position in which it restricts the passage 8 almost completely so that the machine is only supplied with sufficient air for keeping it running at a suitable idling speed. It is obvious from the different figures that frictional contact never occurs between the rotating valve member 18 and the bushing 10 or other stationary parts of the machine.

According to Fig. 3 the end portion 24 of the valve member 18 has substantially hyperboloid shape, but the valve member as well as the bushing 10 and the passage 8 formed therein may have other suitable shapes, as illustrated for instance in Figs. 4 and 5.

According to Fig. 4 the illustrated valve member 18 is provided with a conical end portion 25 arranged for cooperation with a tapering portion 26 of the passage 8.

According to Fig. 5 the valve member 18 is cut off transversely at the end and cooperates with the mouth 27 of the passage 8 in the bushing 10.

The governor illustrated in Fig. 6 serves as an overspeed governor for a compressed air driven tool driven by a rotor **29** disposed in a casing **28**. The rotor shaft **30** carries the governor which is partly built into a cavity **31** in the shaft **30** and partly disposed in a chamber **32** formed in the casing **28**. Said chamber forms the admission chamber of the rotor motor and is supplied with compressed air through a duct **33** and an opening in a bushing **34** which is rigidly secured in the casing **28**. From the chamber **32** the air is conveyed through ducts **49**, **35** in the casing **28** and the end cover **36** of the motor to ducts **37** in the motor cylinder **38**.

The governor consists of a hub **39** screwed into the end of the shaft **30** of the rotor and carrying pins **40** by means of which the governor weights **41** are journalled on the hub **39** in a manner to permit them to be swung outwardly by the centrifugal force. The weights **41** form fingers **42** engaging under an abutment **43** of a plunger-shaped valve member **44** which is arranged for cooperation with the bushing **34** and for controlling the supply of compressed air to the chamber **32** and the rotor motor. Abutments **45** formed on the hub **39** form a limitation for the movement of the centrifugal weights towards the axis of rotation. The valve member **44** is formed integral with a rod **46** extending into the cavity **31** in the rotor shaft **30** and surrounded by a helical spring **47** which is fitted between an adjustable abutment **48** on the rod **46** and the under side of the hub **39**. Said spring of course defines the characteristic of the governor.

The governors above described and illustrated in the drawings should be considered only as examples and the details of the invention may naturally be modified in several different ways within the scope of the claims.

What I claim is:

1. In a fluid driven motor having a casing, a fluid driven rotor journalled in said casing, a chamber in the casing at one end of said rotor communicating with the rotor and a passage for leading motive fluid to said chamber coaxially with the axis of the rotor, a centrifugal governor disposed in the chamber and secured at said end of the rotor coaxially therewith for rotation with the rotor, a sleeve extending axially of said governor in the chamber, centrifugal weights in the governor, a plunger freely movable axially in said sleeve against spring action upon actuation by said centrifugal weights, and an end portion of said plunger disposed opposite the opening of said passage into the chamber and movable against the flow of fluid through the passage to reduce the fluid conveying capacity of the passage without coming into frictional contact with the walls of the passage or other stationary parts of the motor.

2. In a fluid driven motor having a casing, a fluid driven rotor journalled in said casing, a chamber in the casing at one end of said rotor communicating with the rotor and a passage for leading motive fluid to said chamber coaxially with the axis of the rotor, an axial bore in the rotor, a centrifugal governor disposed partly in said chamber and said axial bore and secured to the rotor coaxially therewith for rotation with the rotor, centrifugal weights in the governor, a plunger freely movable axially in the axial bore against spring action upon actuation by said centrifugal weights, and an end portion of said plunger disposed opposite the opening of said passage into the chamber and movable against the flow of fluid through the passage to vary the fluid conveying capacity of the passage without coming into frictional contact with the walls of the passage or other stationary parts of the motor.

3. In a fluid driven motor having a casing, a fluid driven rotor rotatable within said casing, and a passage in the casing including a port for delivering motive fluid to the rotor, a speed responsive device carried by said rotor and a member rotatable with the rotor and operable by said speed responsive device to change the fluid conveying capacity of said passage and movable out of contact with stationary parts of the motor, said member being operable to move freely against the direction of flow of fluid through said port to reduce the conveying capacity thereof, and vice versa.

4. In a fluid driven rotary tool having a casing, a fluid driven rotor rotatable within said casing and a passage in the casing leading motive fluid to said rotor, a centrifugal governor carried by the rotor, a governor weight and a spring in said governor, and a valve member rotatable with the rotor and operable by said centrifugal governor to change the fluid conveying capacity of said passage and movable out of contact with stationary parts of the tool, said valve member being operable to move freely under the action of said governor weights against the action of said spring and the flow of fluid in the passage to reduce the conveying capacity thereof, and vice versa.

5. A speed governor for machines having a casing, a fluid driven rotor journalled in said casing, and a passage for said fluid in said casing communicating with said rotor, comprising a rotary valve member driven by the rotor arranged for operation without frictional contact with the walls of said passage and other stationary parts of the machine to regulate the flow area of the passage by moving against the direction of flow in the passage to reduce the flow area upon an increase of the speed of the machine and by moving in the direction of flow in the passage to increase the flow area upon a reduction of the speed of the machine, and means responsive to the speed of the machine operably connected with said valve member to produce said movements.

6. A speed governor for pneumatic tools having a casing, a compressed air driven rotor journalled in said casing, and a passage for said air in said casing communicating with said rotor, comprising a rotary valve member driven by the rotor arranged for operation free from frictional contact with the walls of said passage and other stationary parts of the tool and free from sealing contact with other parts of said governor to regulate the flow area of the passage by moving against the direction of flow in the passage to reduce the flow area upon an increase of the speed of the tool and by moving in the direction of flow in the passage to increase the flow area upon a reduction of the speed of the tool, and means responsive to the speed of the machine operably connected with said valve member to produce said movements.

7. A speed governor for pneumatic tools having a casing, a compressed air driven rotor journalled in said casing, and a passage for said air in said casing communicating with said rotor, comprising a rotary member driven and carried by the rotor arranged for operation free from frictional contact with the walls of said passage and other stationary parts of the tool and free

from sealing contact with other parts of said governor to regulate the flow area of the passage, centrifugal weights in said governor arranged for moving said member to reduce said flow area upon an increase of the speed of the tool and to increase the flow area upon a reduction of the speed of the tool, and a spring in the governor arranged for actuating the member in opposite direction to said weights, said member being furthermore arranged to be actuated by the pressure of air flowing through said passage in the same direction as said spring, so that said centrifugal weights form an equilibrium against said spring force and said air force.

8. A governor for a fluid operated device of the type comprising a casing, a rotor in said casing, a shaft for said rotor and a fluid passage leading to said rotor and including a chamber having a relatively small diameter stationary inlet; said governor comprising a flow controlling member in said chamber in line with said inlet, spaced from said inlet in all normal operating positions thereof, and having a diameter at least as great

as the diameter of said inlet, means for supporting said member on the rotor shaft in coaxial relation with the rotor and with said inlet for movement toward and from said inlet, and a centrifugal device in said chamber having means for connecting the same with said rotor shaft for rotation therewith and having parts to engage said member and move the same toward said inlet while remaining out of contact therewith and reduce the area of flow of fluid to said rotor when the speed of rotation of said shaft exceeds a predetermined speed.

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