March 16, 1943. F. A. JIMERSON 2,314,218

SAFETY DEVICE

Filed Sept. 3, 1942

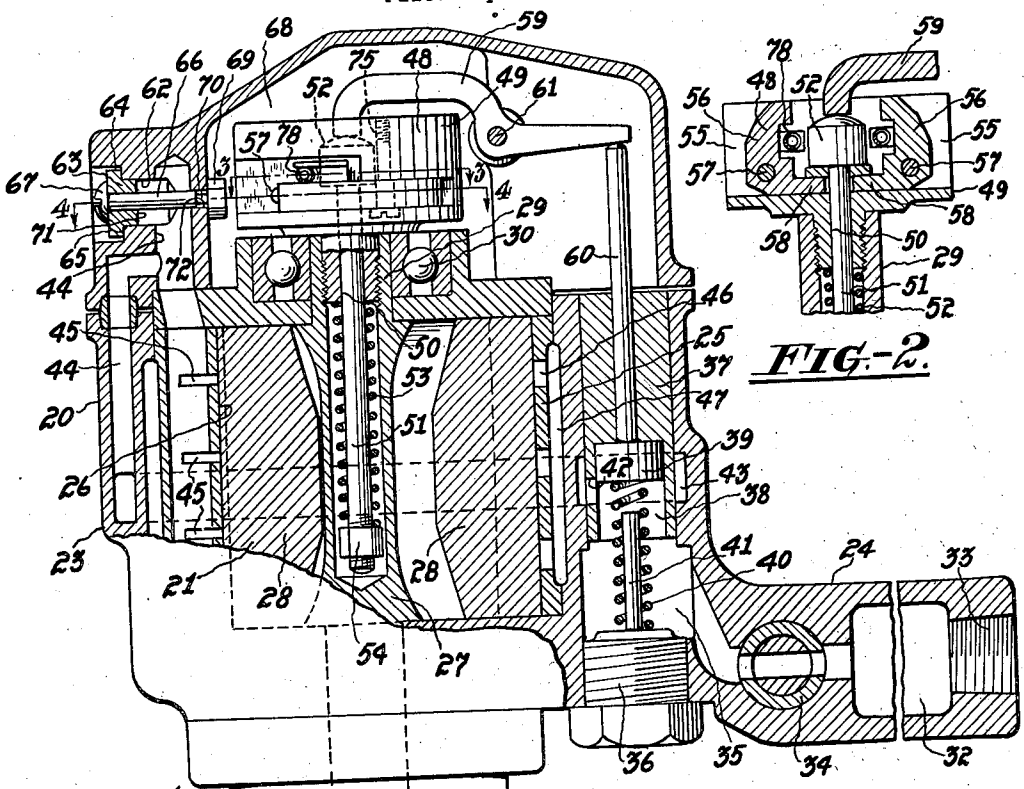

FIG.-1.

FIG.-2.

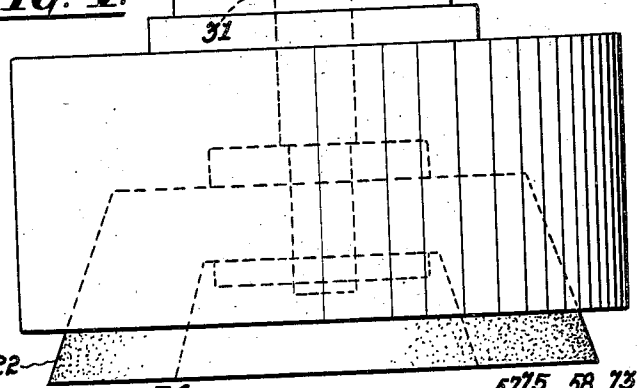

FIG.-3.

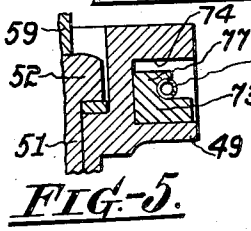

FIG.-5.

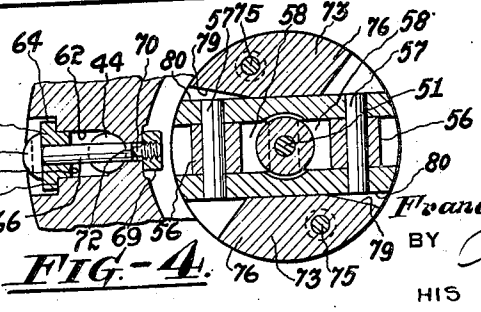

FIG.-4.

INVENTOR
Francis A. Jimerson.
BY
HIS ATTORNEY.

Patented Mar. 16, 1943 2,314,218

UNITED STATES PATENT OFFICE

2,314,218

SAFETY DEVICE

Francis A. Jimerson, Athens, Pa., assignor to Ingersoll-Rand Company, New York, N. Y., a corporation of New Jersey

Application September 3, 1942, Serial No. 457,160

3 Claims. (Cl. 121—34)

This invention relates to motors, and more particularly to a safety device for motors of the fluid actuated type.

One object of the invention is to prevent the operation of the motor at dangerous speeds.

Another object is to automatically effect a reduction in the pressure value of the fluid intended to drive the motor whenever the motor speed reaches a predetermined rate.

A more specific object is to automatically effect communication between the passage conveying pressure fluid to the motor and the atmosphere whenever the motor speed reaches a dangerous rate.

Other objects will be in part obvious and in part pointed out hereinafter.

In the drawing accompanying this specification and in which similar reference numerals refer to similar parts,

Figure 1 is an elevation, partly broken away, of a pneumatically operated portable grinding machine equipped with a safety device constructed in accordance with the practice of the invention,

Figure 2 is a similar view of a detail,

Figures 3 and 4 are transverse views taken through Figure 1 on the lines 3—3 and 4—4, respectively, and,

Figure 5 is an elevation of a detail taken through Figure 3 on the line 5—5.

Referring more particularly to the drawing, the invention is shown, for the sake of illustrating a practical application thereof, as being embodied in a portable grinding machine 20 having a pneumatically actuated motor 21 for driving a grinding wheel 22.

On the side of the casing 23 of the grinding machine is a handle 24 for manipulating the machine, and in the casing 23 is a cylinder 25 that is bored to provide a piston chamber 26 for a rotary piston 27. The piston 27 is arranged eccentrically within the chamber 26 and carries a plurality of radially arranged slidable vanes 28 against which pressure fluid acts for driving the piston. On one end of the piston is a trunnion 29 that extends into an anti-friction bearing 30, and on the opposite end of the piston is a shaft portion 31, the free end of which may be secured to the grinding wheel 22 in any well known manner.

The pressure fluid supply for operating the motor 21 is conveyed thereto by the handle 24 the handle being provided with a passage 32 having its outer end threaded, as indicated by 33, for connection with a conduit leading from a source of pressure fluid supply. The passage 32 is controlled by a throttle valve 34 journaled in the handle and opens into a supply chamber 35 in the casing 23.

The supply chamber 35 is sealed at its outer end by a plug 36 threaded thereinto and at its opposite end by a bushing 37 having a chamber 38 for the accommodation of a throttle valve 39 which controls the flow of pressure fluid from the supply chamber to the piston chamber 26. The throttle valve 39 is of the reciprocatory type and is normally held in position to admit pressure fluid to the piston chamber by a spring 40 which is arranged upon a stem 41 of the plug 36 and seats against the throttle valve 39.

The outlet for pressure fluid from the supply chamber 35 to the motor consists of a port 42 in the wall of the bushing 37 and is located in such wise that it may be controlled by the throttle valve 39. The port 42 opens into an annular groove 43, in the casing 23, encircling the bushing 37. The annular groove 43 in turn communicates with a supply passage 44 in the casing, and inlet passages 45 afford communication between the supply passage 44 and the piston chamber 26.

Exhaust ports 46 in the cylinder 25 convey the exhaust fluid from the piston chamber to an exhaust chamber 47 in the casing whence exhaust fluid may pass to the atmosphere.

In the arrangement shown, the throttle valve 39 is actuated to perform its controlling function by a governor 48 acting in response to the speed of the piston 27. The governor may be of a well known type comprising a guide member 49 that is threadedly connected to the trunnion 29 and has an aperture 50 therethrough to slidably receive a rod 51 carrying a head 52 at its outer end. The rod 51 extends into the piston 27 and is encircled by a spring 53 that seats at one end against the guide member and at its other end against a nut 54 on the rod 51 to resist endwise movement of the rod in an outwardly direction.

Within a slot 55 in the guide member 49 are a pair of centrifugal weights 56 of angular shape that are pivoted upon pins 57 seated in the guide member and have arms 58 extending beneath the head 52 to transmit the centrifugal movement of the weights 56 to the rod for moving said rod outwardly. This movement of the rod is transmitted to the throttle valve by a rocker bar 59 that seats with one end against the outer end of the head 52 and with its opposite end against a stem 60 on the throttle valve 39. The rocker bar is mounted upon a pivot pin 61 supported by

the casing and extending through the rocker bar intermediate its ends.

The rocker bar 59 is so positioned that its opposed ends will constantly seat against the head 52 and the stem 60, and the throttle valve 39 will, therefore, always be immediately responsive to any movement of the rod 51 accordingly as the rod moves endwise in response to movement of the weights 56.

In the use of machines equipped with devices for automatically controlling the speed of the rotative parts, as in the example herein described, it has been found that, notwithstanding good design and careful construction, these parts may become damaged or worn to such an extent that they fail to operate effectively so that the motor speed may accelerate to a dangerous rate.

In view of the foregoing it is contemplated to provide the machine with a second safety device designed to come into action at a predetermined speed of somewhat higher rate than that at which the motor normally operates. To this end the casing 23 is provided with a relief port 62 to afford communication between the supply passage 44 and the atmosphere. The relief port 62 is preferably of equal or larger flow area than the supply passage so that it will pass most or all of the pressure fluid from the supply passage 44 and whatever pressure fluid may enter the piston chamber 26 will be insufficient to cause overspeeding of the piston 27.

The port 62 is normally closed by a plug 63 that extends, in the present instance, into the outer end of the port 62 and has a flange 64 to cooperate with a seating surface 65 around the outer end of the port 62 for sealing said port. The plug 63 is held against the seat 65 by a bolt 66 that extends through the plug and has a head 67 seating against the outer end thereof. The opposite end of the bolt 66 extends into the chamber 68 containing the governor 48 to a point near the peripheral surface of the guide member 49 and lies in the plane of rotation of said guide member. A nut 69 is threaded on the end of the bolt lying in the chamber 68 to lock the plug in sealing position, and the body of the bolt is provided with a section 70 of reduced diameter to provide a weakened zone in the bolt immediately beneath the nut 69.

The section 70, while of large enough cross-sectional area to withstand the forces to which it is normally subjected, as for example the pressure of the fluid in the supply passage 44 against the inner end or pressure surface 71 of the plug 63, is so proportioned that it will break readily when a blow is struck against the nut 69. In the arrangement shown the weakened section 70 lies within an aperture 72 in the casing and the said aperture is of a length to accommodate both the weakened section 70 and the adjacent portion of the body of the bolt, which it substantially equals in diameter, so that the portion of the bolt lying between the weakened section 70 and the plug 63 will always remain rigid in the assembled position of these parts.

The means provided for breaking the bolt at the weakened section 70 under certain conditions of operation of the motor also act in response to the speed of the piston 27, in the present instance at a predetermined speed somewhat in excess of that at which the motor normally operates, and consists of a pair of centrifugal weights 73 carried by the guide member 49. The weights 73 lie in opposed recesses 74 in the peripheral surface of the guide member and are positioned to rock through the plane of rotation of the guide member. They are mounted pivotally upon pins 75 in the guide member and on the mass portions 76 of said weights are lugs 77 to provide seats for an endless coiled spring 78 that resists the centrifugal force of both weights 73.

The weights 73 are so positioned on the guide member 49 that their mass portions 76 constitute the leading ends in the circle of rotation of the guide member and will, therefore, serve as the impact end for striking the nut 69 to break the bolt 66, and on the trailing ends of the weights 73 are flatted surfaces 79 that engage the bottom surfaces 80 of the recess 74 for limiting the degree of outward movement of the weights 73.

As will be apparent from the foregoing description, the speed of the motor is normally controlled by the governor 48 the weights of which will operate in accordance with variations in the speed of the motor to control the position of the throttle valve 39 and, therefore, the flow area of the port 42. In the event, however, that these devices fail to perform their controlling functions and the motor speed is accelerated greatly, as a result, the weights 73 will be actuated centrifugally toward the bolt 66 and one of them will collide with the nut and break the bolt 66 at the reduced section 70.

The holding force on the plug 63 will thereby be released and the pressure fluid acting against the pressure surface 71 will blow the plug 63 out of the port 62. In this way the supply passage 44 will be placed in direct communication with the atmosphere and such fluid as may thereafter flow into the piston chamber 26 will be of insufficient presure value to operate the piston at a high rate of speed.

I claim:

1. A safety device for a motor comprising a casing having a piston chamber and a pressure fluid supply passage for the piston chamber, a piston in the piston chamber, a relief port in the casing for the supply passage, a sealing member for the relief port having a pressure surface subjected to the pressure fluid in the supply passage, a locking member for locking the sealing member in position to seal the relief port, and means acting in response to a predetermined speed of the piston for rendering the locking member ineffective to hold the sealing member in sealing position and thereby enable the pressure fluid acting against the pressure surface to move the sealing member from its sealing position for opening the relief port.

2. A safety device for a motor comprising a casing having a piston chamber and a pressure fluid supply passage for the piston chamber, a piston in the piston chamber, a relief port in the casing for the supply passage, a sealing member for the relief port having a pressure surface subjected to the pressure fluid in the supply passage, a locking member for locking the sealing member in position to seal the relief port, and means acting in response to a predetermined speed of the piston for breaking the locking member to release the sealing member and enable the pressure fluid acting against the pressure surface to move the sealing member from its sealing position to open the relief port.

3. A safety device for a motor comprising a casing having a piston chamber and a pressure fluid supply passage for the piston chamber, a piston in the piston chamber, a relief port in the casing for the supply passage, a sealing member

for the relief port having a pressure surface subjected to the pressure fluid in the supply passage, a locking member for locking the sealing member in position to seal the relief port and having a weakened section, and a centrifugally operated weight acting in response to a predetermined speed of the piston to strike the locking member for breaking it at the weakened section and thereby release the sealing member to enable the pressure fluid acting against the pressure surface to move the sealing member for uncovering the relief port.

FRANCIS A. JIMERSON.