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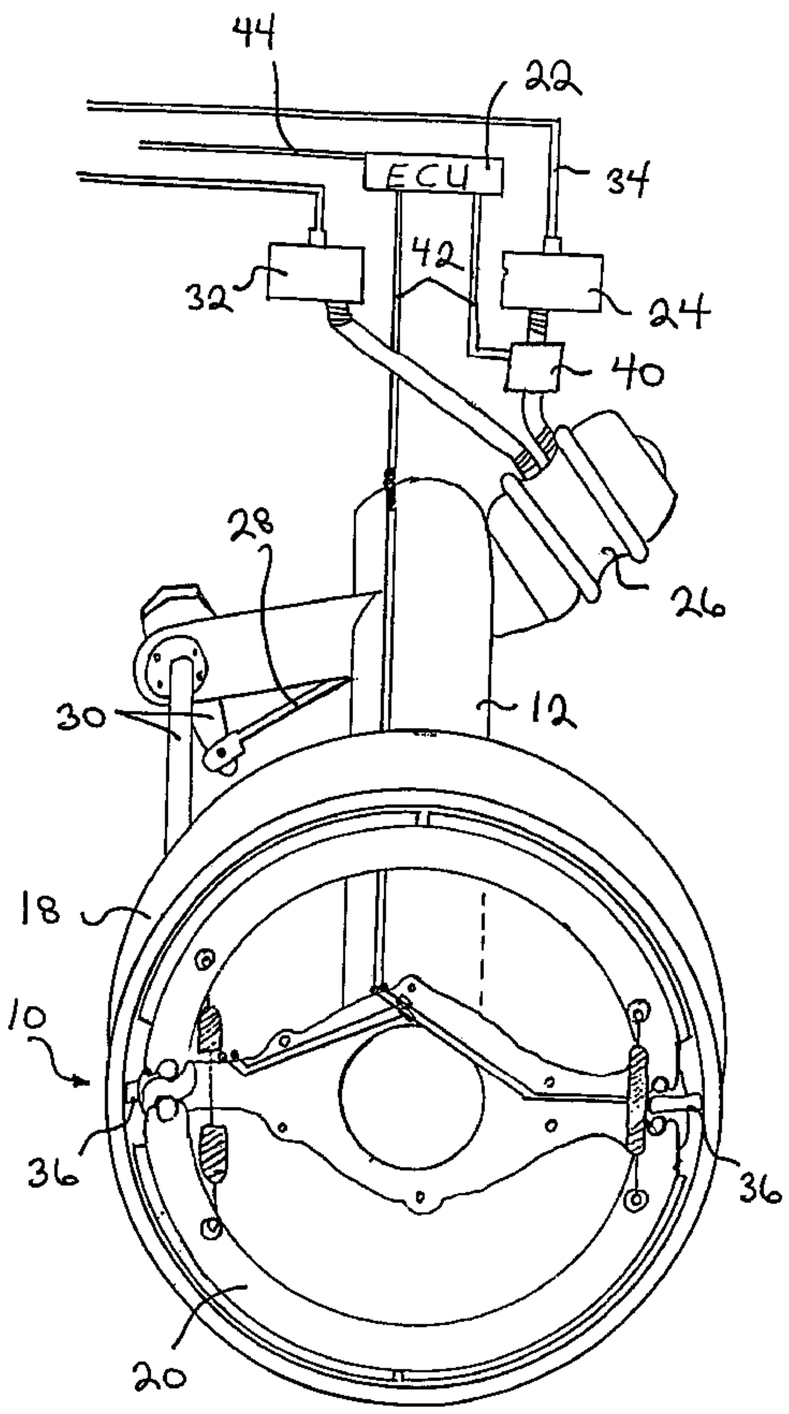
(54) Titre : METHODE ET APPAREIL POUR SURVEILLER UNE ROUE DE VEHICULE
(54) Title: METHOD AND APPARATUS FOR MONITORING A VEHICULAR WHEEL



(57) Abrégé/Abstract:
A method and apparatus for monitoring a vehicular wheel. Firstly, focus alignment sensors on a vehicular wheel, thereby monitoring concentric rotation of the vehicular wheel. Secondly, connect the alignment sensors to a signal generator. The sensing of misalignment and eccentric rotation of the vehicular wheel is signalled in a timely fashion by the signal generator to provide an operator with an opportunity to stop safely prior to wheel loss occurring.

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ABSTRACT OF THE DISCLOSURE

A method and apparatus for monitoring a vehicular wheel. Firstly, focus alignment sensors on a vehicular wheel, thereby monitoring concentric rotation of the vehicular wheel. Secondly, connect the alignment sensors to a signal generator. The sensing of misalignment and eccentric rotation of the vehicular wheel is signalled in a timely fashion by the signal generator to provide an operator with an opportunity to stop safely prior to wheel loss occurring.

TITLE OF THE INVENTION:

method and apparatus for monitoring a vehicular wheel

FIELD OF THE INVENTION

The present invention relates to a method and apparatus for monitoring vehicular wheels and, in particular, the wheels of transport trucks.

BACKGROUND OF THE INVENTION

It is not uncommon for a transport vehicle, without prior warning, to lose a wheel. There are a number of causes for the sudden loss of a wheel; for example the failure of a bearing or a lug nut. The loss of a wheel by a transport vehicle can result in property damage or serious injury. In 1996, at least two fatalities can be attributed to such accidents.

SUMMARY OF THE INVENTION

What is required is a method and apparatus for monitoring a vehicular wheel, so as to make the operator of a transport vehicle aware of a potential problem before it leads to the loss of a wheel.

According to one aspect of the present invention there is provided a method for monitoring a vehicular wheel. Firstly, focusing alignment sensing means on a vehicular wheel, thereby

monitoring concentric rotation of the vehicular wheel. Secondly, connecting the alignment sensing means to signalling means. The sensing of misalignment and eccentric rotation of the vehicular wheel is signalled in a timely fashion by the signalling means to provide an operator with an opportunity to stop safely prior to wheel loss occurring.

According to another aspect of the present invention there is provided an apparatus for monitoring a vehicular wheel which includes a vehicular axle and a vehicular wheel rotatably mounted on the axle. Alignment sensing means are on the axle and focused upon the wheel, thereby monitoring concentric rotation of the vehicular wheel. Signalling means are coupled to the alignment sensing means, such that a signal is given by the signalling means upon the alignment sensing means sensing misalignment and eccentric rotation of the vehicular wheel.

The invention, as described above, enables a wheel to be monitored and the operator of a transport vehicle warned before a loss of a wheel occurs. The placement of the sensor may vary, depending upon the type of problem being monitored. In order for a complete monitoring to occur it may be necessary to focus sensors on more than one portion of the wheel. It is preferred that the alignment sensing means be focused upon a brake drum for the wheel, a rim of the wheel or both.

Although beneficial results may be obtained through the use of the invention, as described above, irresponsible operators may have a tendency to ignore the warning given by the signalling means, in order to get down the road to the next populated center. Even more beneficial results may, therefore, be obtained when the signalling means including means for activating vehicular brakes. Preferably, the vehicular brakes are activated a pre-determined time interval after a warning signal has been given by the signalling means.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other features of the invention will become more apparent from the following description in which reference is made to the appended drawings, wherein:

FIGURE 1 is a perspective view of an axle equipped with a wheel monitoring apparatus in accordance with the teachings of the present invention.

FIGURE 2 is a front elevation view of a wheel mounted upon the axle illustrated in **FIGURE 1**.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The preferred embodiment, an apparatus for monitoring a vehicular wheel generally identified by reference numeral 10, will now be described with reference to **FIGURES 1 and 2**.

Referring to **FIGURE 2**, an existing wheel mounting includes an axle 12 onto which a wheel 14 having a rim 16 is mounted. Referring to **FIGURE 1**, axle 12 has a brake drum 18 mounted at each end. Inside brake drum 18 is a movable brake shoe 20. The brake activation system includes a control unit 22. Control unit 22 is connected to a pneumatic valve 24 which is connected to a spring pot 26. Spring pot 26 is connected by a push rod 28 to an brake activating arm 30. As brake activating arm 30 moves, movable brake shoe 20 is brought in contact with brake drum 18. A pedal activated pneumatic valve 32, also is connected to spring pot 26.

Spring pot 26 has an internal spring (not shown) that exerts a force upon push rod 28 to bring movable brake shoe 20 into contact with brake drum 18. Spring pot 26 can be considered to have two portions. The first portion is supplied with air by pneumatic valve 24 to overcome the biasing force of the internal

spring and allow normal operation of the brakes. The second portion is selectively supplied with air by pneumatic valve 32 in response to pedal pressure to apply the brakes when the vehicle is in motion. The internal spring within spring pot 26 causes a vehicle to have its brakes applied until air is supplied to the system. When the vehicle is started and the air system for the vehicle is activated, air is supplied through air conduit 34 to pneumatic valve 24. Pneumatic valve 24 supplies air to spring pot 26, sufficient to compress its internal spring, thereby releasing the brakes so the vehicle can be moved. Thereafter, the brakes are applied by pedal activated pneumatic valve 32. When pedal activated pneumatic valve 32 is activated by pedal pressure, push rod 28 moves brake activating arm 30 to bring movable brake shoe 20 into contact with brake drum 18.

In order to modify the system, as described above, so that its components are monitored, two sets of alignment sensors 36 and 38 are mounted on axle 12 and a bleed valve 40 is connected to air conduit 34 between spring pot 26 and pneumatic valve 24. Sensors 36 and 38, and bleed valve 40 are all connected by a control circuit 42 to control unit 22. Referring to **FIGURE 1**, alignment sensors 36 are focused upon brake drum 18. Referring to **FIGURE 2** alignment sensors 38 are focused upon rim 16.

The method of use and operation of wheel monitoring apparatus 10 will now be described with reference to **FIGURES 1** and **2**. Wheel monitoring apparatus 10 has been configured to address two common types of failures that result in wheel loss; bearing failure and lug nut failure. Should a bearing fail, alignment sensors 36 monitoring brake drum 18 will sense misalignment and the start of eccentric rotation of the vehicular wheel 14 which always precedes wheel loss. Should a lug nut fail, alignment sensors 38 monitoring rim 16 will, similarly, sense misalignment and the start of eccentric rotation of the vehicular

wheel. When either alignment sensors 36 or 38 sense misalignment, a signal is sent along control circuit 42 to control unit 22. Control unit 22 sends a warning signal along signal connection line 44 to an audio and/or visual signal generator (not shown) positioned within the cab of the vehicle. If the vehicle is still in motion a pre-determined time interval after the warning signal has been given, control unit 22 activates bleed valve 40 which cuts off the supply of air from pneumatic valve 24 to spring pot 26. As spring pot 26 is gradually deprived of air, its internal spring exerts a force upon push rod 28 to gradually apply the vehicular brakes, bringing the vehicle to a gradual and safe stop. It is preferred that the bleed off time for bleed valve 40 be approximately 2 to 4 minutes. It may be desirable to program control unit 22 to allow bleed valve 40 to be temporarily reset in order to get the vehicle to an area that is safe to park. It is also preferred that the number of times bleed valve 40 can be reset be limited, in order to prevent negligent drivers from circumventing the monitoring system.

It will be apparent to one skilled in the art that modifications may be made to the illustrated embodiment without departing from the spirit and scope of the invention as hereinafter defined in the Claims.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A method for monitoring a vehicular wheel, comprising the steps of:

firstly, mounting a sensor to an axle sheltered within a brake drum of a vehicular wheel, the sensor being mounted a fixed distance from the brake drum, the sensor being focused upon the brake drum and adapted to detect variations in distance to the brake drum indicative of eccentric rotation as a precursor to loss of the vehicular wheel;

secondly, connecting the sensor by means of a control circuit to a control unit which is connected by a signal connection line to signalling means, such that eccentric rotation of the vehicular wheel is communicated by the sensor via the control circuit to the control unit, the control unit activating the signalling means via the signal connection line to cause a warning signal to be provided in a timely fashion so that an operator has an opportunity to stop safely prior to wheel loss occurring.

2. The method for monitoring a vehicular wheel as defined in Claim 1, the control unit being coupled to a bleed valve which alters the supply of air to pneumatic brakes on the vehicle, the pneumatic brakes being biased to a braking position in the event of a loss of air pressure, should the vehicle not come to a stop within a pre-determined time interval after the warning signal has been given by the signalling means, the control unit activates the bleed valve to gradually deprive the pneumatic brakes with air until the pneumatic brakes move to the braking position due to loss of air pressure.

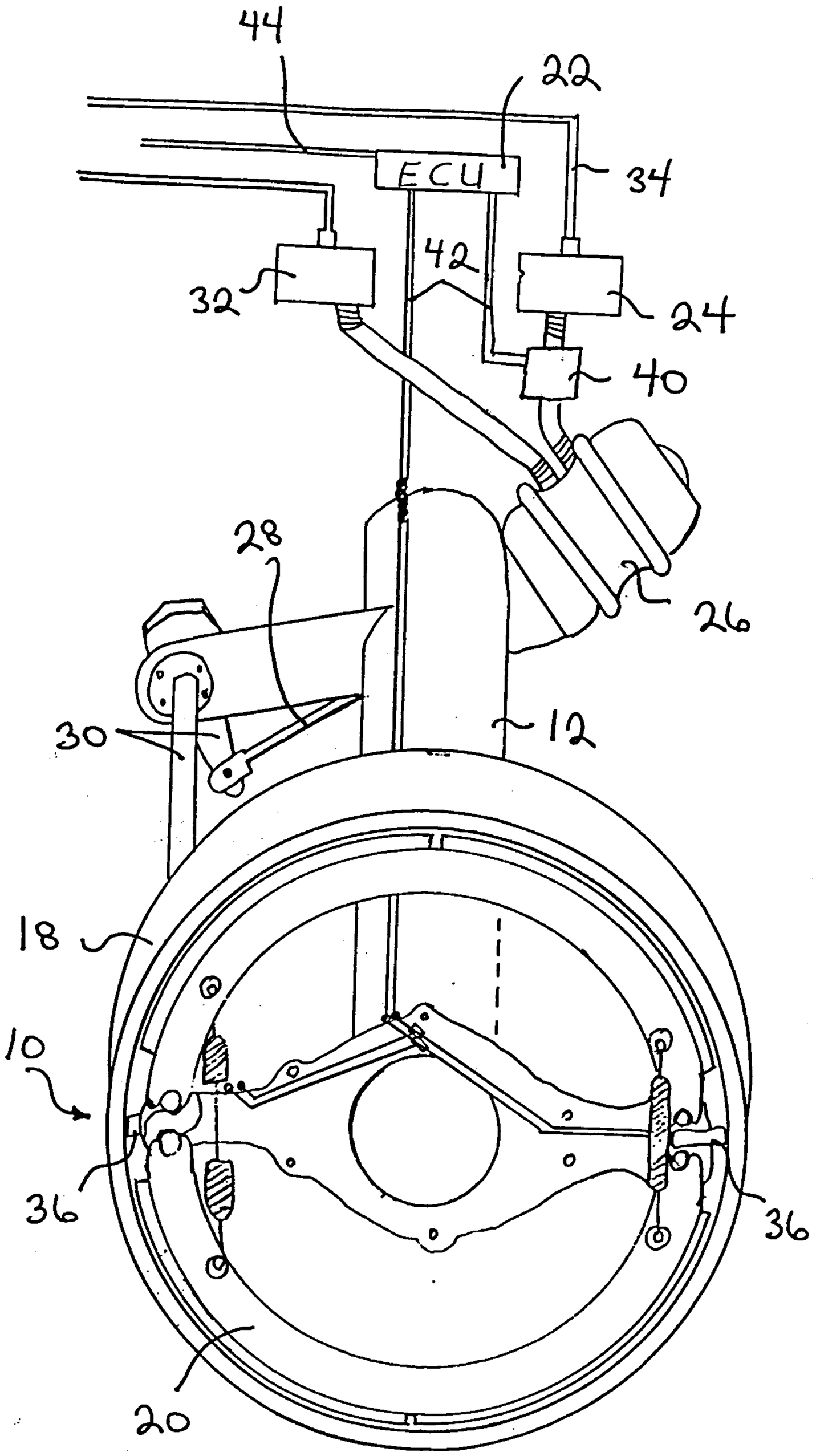


FIGURE 1

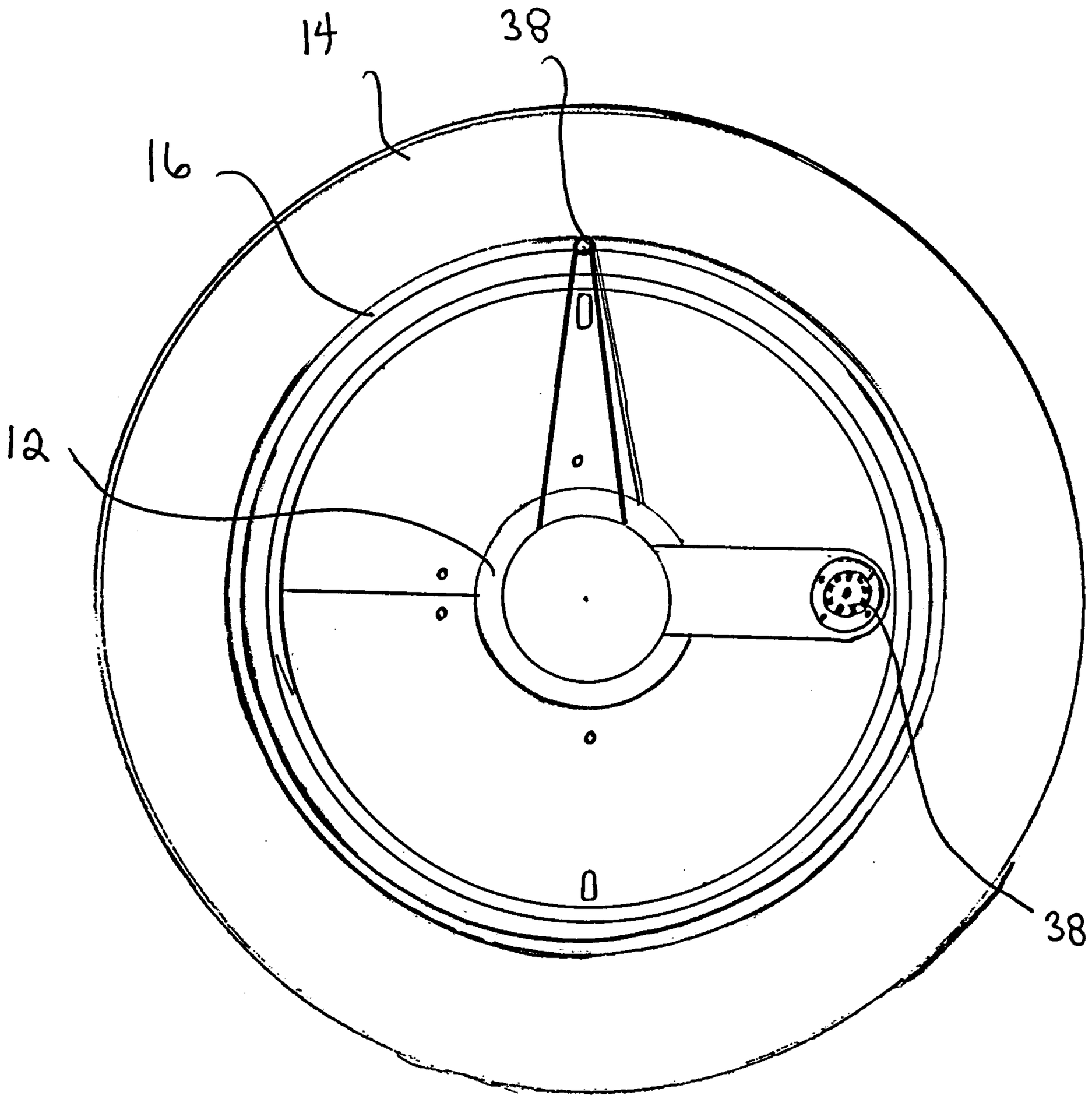
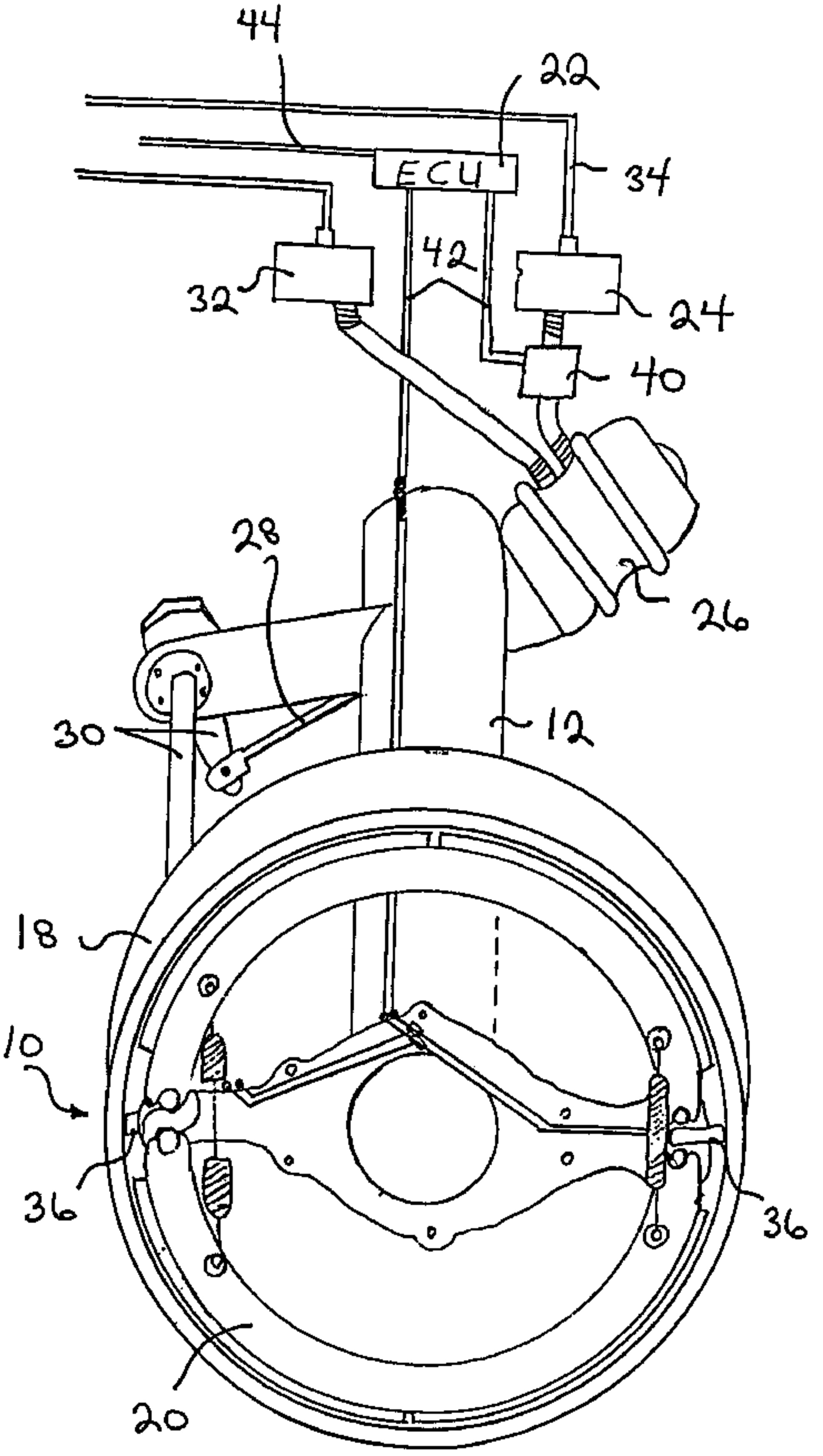


FIGURE 2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