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(71)(72) Applicant and Inventor: BINDER, Noel [GB/GB]; 28 Walton Park, Pannal, Harrogate HG3 1EJ (GB).

(74) Agent: URQUHART-DYKES & LORD; Tower House, Merrion Way, Leeds LS2 8PA (GB).

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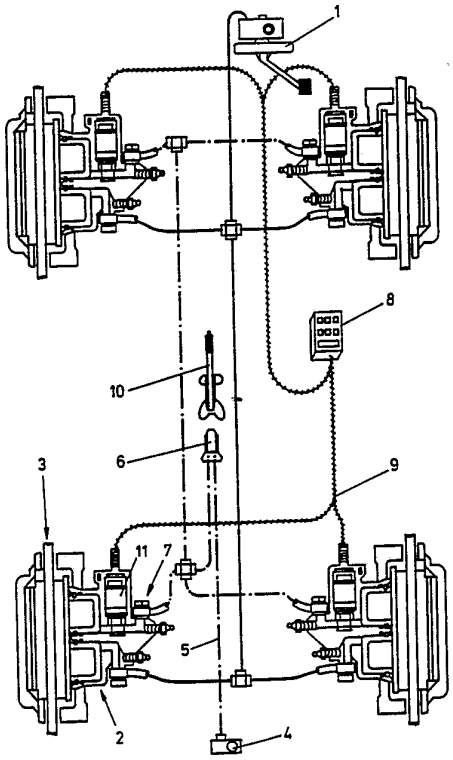
(57) Abstract

A vehicle anti-theft arrangement comprises a multiplicity of primary and secondary braking cylinders, each secondary braking cylinder being additional to the primary braking cylinder of a respective wheel and being integral with the wheel brake assembly (7). Each secondary cylinder is actuated in use by application of the vehicle parking brake (10) and each secondary cylinder incorporates a latch (11) arranged to immobilise the respective wheel when the hand brake is applied.



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VEHICLE ANTI-THEFT ARRANGEMENT

This invention relates to a vehicle anti-theft arrangement.

Many conventional vehicle anti-theft devices immobilise the front or rear wheels of the vehicle but not both and consequently do not prevent a determined thief using a towing truck or jack. Thus a valuable car or trailer containing valuable merchandise may be stolen if left unattended for sufficient time.

In my previous publication W090/06248 I disclosed an anti-theft arrangement including a multiplicity of valves, each valve being integral with the hydraulic braking system of a respective wheel and arranged to be actuated to interrupt the supply of hydraulic fluid to said system while the brakes are engaged.

According to the present invention a vehicle antitheft arrangement comprises a multiplicity of primary and secondary braking cylinders, each secondary braking cylinder being additional to the primary braking cylinder of a respective wheel and being integral with the wheel brake assembly, each secondary cylinder being actuated in use by application of the vehicle parking brake, each secondary cylinder incorporating a latch arranged to immobilise the respective wheel when the parking brake is applied.

The latch may engage the piston of the respective cylinder directly or, more preferably closes the hydraulic supply line to the cylinder within or adjacent the wheel assembly.

In use of the apparatus a user may actuate the hand brake to engage each of the secondary cylinders. Actuation of a keyboard or other locking arrangement then closes the latches to secure the wheels in the locked state.
Subsequent cutting of the brake pipes or manipulation of the hand brake does not release the locking arrangement. The vehicle cannot be moved using towing apparatus.

Each latch may comprise a solenoid actuated valve located in the casing of the wheel cylinder or brake caliper of the respective wheel. The valves are preferably deadlocking so that

they remain closed when the solenoids are de-energised.

Provision of primary and secondary braking pistons allows the primary braking system to operate independently without possible interference by the anti-theft arrangement. The system of this invention may operate independently of the normal function of the hand brake.

The system has the advantage that in the event of brake failure the vehicle may be brought safely to a halt using the hand brake, the vehicle being halted by all four wheels instead of two as would be the case using a conventional hand brake. This prevents a possible cause of loss of control of the vehicle.

The first piston may have greater area than the second piston so that most of the braking force is applied through the first piston. The second piston preferably provides sufficient force to immobilise the vehicle when the valve is closed. Provision of first and second pistons in accordance with the preferred aspect of this invention has the advantage of the vehicle braking system is not inactivated in the event that the valve fails to function.

The first and second pistons may be arranged to act directly upon the brake disc, calipers or other conventional braking means. The first and second braking pistons may be incorporated in a single caliper. Alternatively separate calipers may be provided. The latter arrangement is not preferred because of the complexity of manufacture.

A sensor may be arranged to provide a display, for example on the vehicle dashboard, to confirm to a user that the locking system is safely deactivated and that accidental application of the locking system is prevented. The display may also serve to alert a user to any malfunction in the locking arrangement, for example if one of the valves becomes seized. The latch may comprise a pin or other member arranged to engage and secure the latch member when the latter is in the open unlocked condition.

The anti-theft arrangement may further comprise one or more security systems, one embodiment of which may be a keyboard which prevents unlocking of the braking wheel system.

This may be used linked to solenoids which may be mounted to all doors, locks, boots and bonnets, thus preventing the vehicle from being removed or opened by any unauthorised person without the private code, codes,
private identification number or words of the owner.
Removal of the vehicle is prevented as the number or code must be correctly entered, preferably within a specified time to activate the release of the anti-theft device. Alternative arrangements for example using a magnetically coded card or a key may be employed.

The invention is further described by means of example, but not in any limitative sense, with references to the accompanying drawings, of which:

Figure 1 illustrates the braking system of a vehicle incorporating an anti-theft arrangement in accordance with this invention; and

Figure 2 is a cross-sectional view of a wheel assembly shown in Figure 1.

The arrangement shown in Figure 1 includes a conventional brake pedal 1 connected by a conventional hydraulic brake pipe to the brake cylinders 2 of respective wheels 3 of the vehicle. A secondary braking reservoir 4 communicates via a brake pipe 5 with an actuator 6 connected to the hand brake 10. When the hand brake 10 is applied, brake fluid is driven by the actuator 6 through a brake pipe system which is separate from the main brake pipe to secondary braking cylinders 7 on each of the vehicle wheels 3. The secondary cylinders 7 are preferably but not essentially integral with the wheel assembly and act directly on the brake disc. The construction of the wheel assembly is described in greater detail with reference to Figure 2. An electronic keyboard or other means for entering a private identifiction number or code 8 is connected to each of the solenoids 11 by means of an armoured conduit cable 9. The keyboard is arranged to deliver command signals to solenoid on each of the secondary cylinders 11.

The construction of the secondary cylinder 7 and solenoid

11 is shown in greater detail in Figure 2. The arrangement comprises a conventional brake piston 20 supplied by hydraulic fluid from the brake pipe 21 connected to the master cylinder by the foot brake pedal (not shown). The piston 20 acts upon brake pads 22 on the wheel disc 23 located within the housing 24. A secondary brake cylinder 25 is actuated by fluid supplied via the hand brake and brake line 26. A solenoid operated latch 27, disposed within the housing 24 is arranged on actuation by a signal delivered through armoured cable 29, to interrupt the flow of hydraulic fluid to the secondary piston 25. The pressure applied to the piston 25 is maintained when the solenoid 27 is actuated to close the brake line 26. The vehicle is thus immobilised irrespective of cutting of the brake lines or other interference with the braking system. Bleed nipples 28 serve to facilitate purging of the system in conventional manner.

The solenoid 27 is preferably deadlocking so that it remains in a closed or open state when de-energised.

The solenoid may incorporate a ratchet arrangment to ensure secure application but quick release. In alternative embodiments of the invention the solenoid 27 may act directly on the brake cylinder 25. For example when the brake cylinder 25 is urged against the brake pad 22, and the solenoid is actuated, the ram of the solenoid may bear against the piston 25 preventing motion away from the brake pad. In a further alternative embodiment of the invention the solenoid 27 may be replaced by an actuator which operates a cam, reduction gearing or other means arranged to drive a locking member into contact with the piston 25. For example a worm gear actuated by a motor may be used to restrain motion of the piston 25. The arrangement may include a ratchet.

In use of the apparatus a driver actuates the brake pedal 1 to control the speed of the vehicle during normal driving. When he wishes to park the vehicle, application of the hand brake 10 applies pressure to the secondary cylinders 25. While the pressure is maintained, the keyboard 8 may be actuated by entering a private identification number or other code to

engage the solenoids 11. The secondary cylinders are thereby locked preventing release of the respective wheels. To release the antitheft arrangement, a private identifiction number or other code must be entered via the keyboard 8 in order to unlock the solenoids 11.

In addition to the anti-theft facility provided by the present invention, actuation of the hand brake 10 while the vehicle is in motion serves to apply braking force to each of the vehicle wheels. This may be necessary in an emergency, for example in the event of failure of the primary braking system. All of the vehicle wheels are engaged preventing possible loss of control of the vehicle.

The secondary pistons 25 may have a smaller area than the primary pistons 20 so that less braking force is applied by them. In preferred embodiments of the invention the force may be sufficient to prevent motion of the vehicle when at rest. The sufficient braking of the vehicle is not inhibited in the event of failure of the anti-theft system.

CLAIMS

1. A vehicle anti-theft arrangement comprising a multiplicity of primary and secondary braking cylinders each secondary braking cylinder being additional to the primary braking cylinder of a respective wheel and being integral with the wheel brake assembly of said wheel, each secondary braking cylinder being actuated in use by application of the vehicle parking brake, each secondary cylinder incorporating a latch arranged to immobilise the respective wheel when the parking brake is applied.

2. An arrangement as claimed in Claim 1, wherein the latch is arranged to close a hydraulic supply line to the secondary cylinder within or adjacent the wheel assembly.

3. An arrangement as claimed in Claim 1 wherein the latch engages the secondary cylinder directly.

4. An arrangement as claimed in Claim 2 wherein the latch comprises a solenoid actuated valve.

5. An arrangement as claimed in Claim 4 wherein said valve is deadlocking.

6. An arrangement as claimed in any preceding claim wherein said first piston has an area greater than said second piston.

7. An arrangement as claimed in any preceding claim wherein said first and second pistons are arranged to act directly on the brake disc or callipers of the respective said vehicle wheel.

8. An arrangement as claimed in Claim 3 wherein said latch includes a member arranged to secure the latch in an open condition.

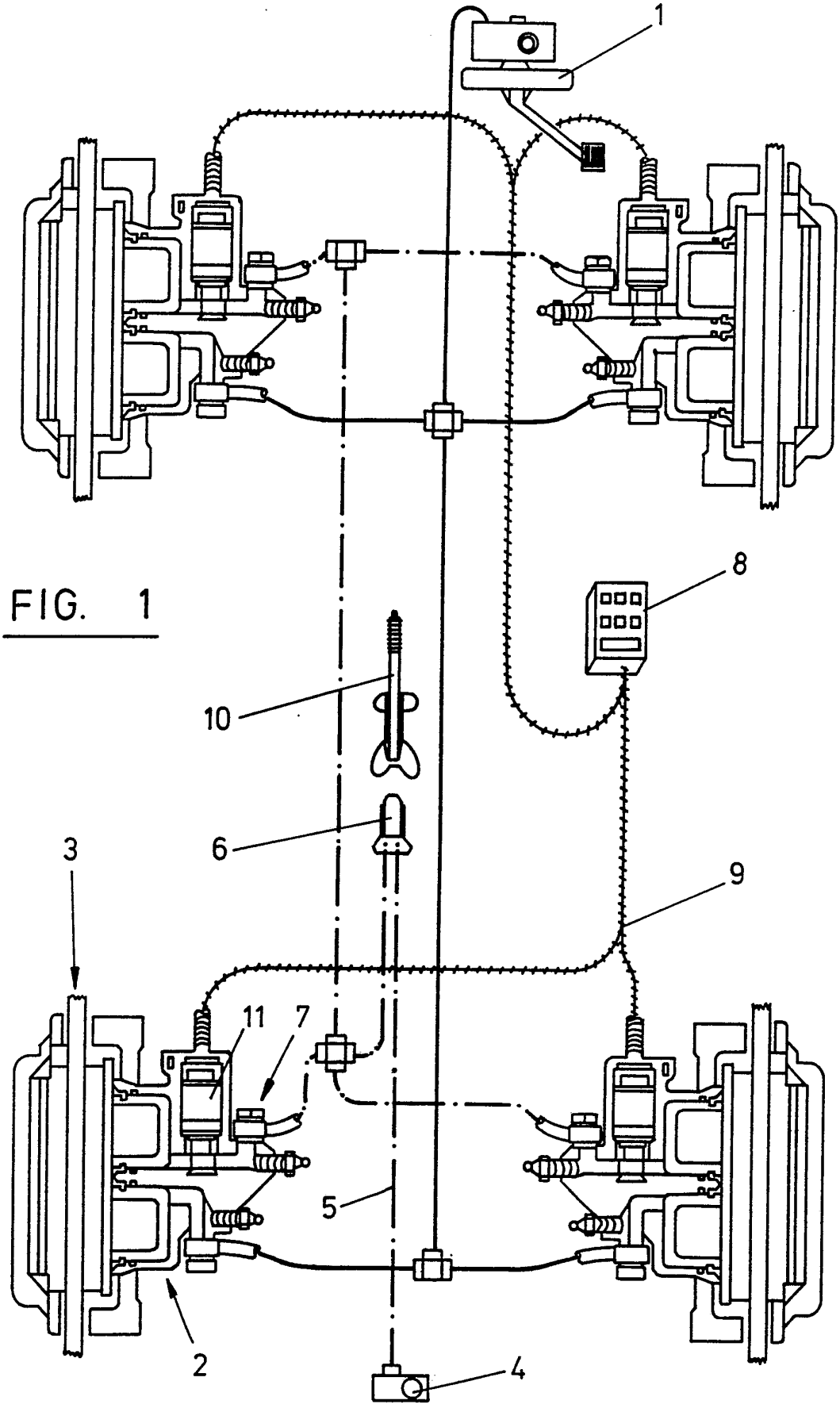

FIG. 1

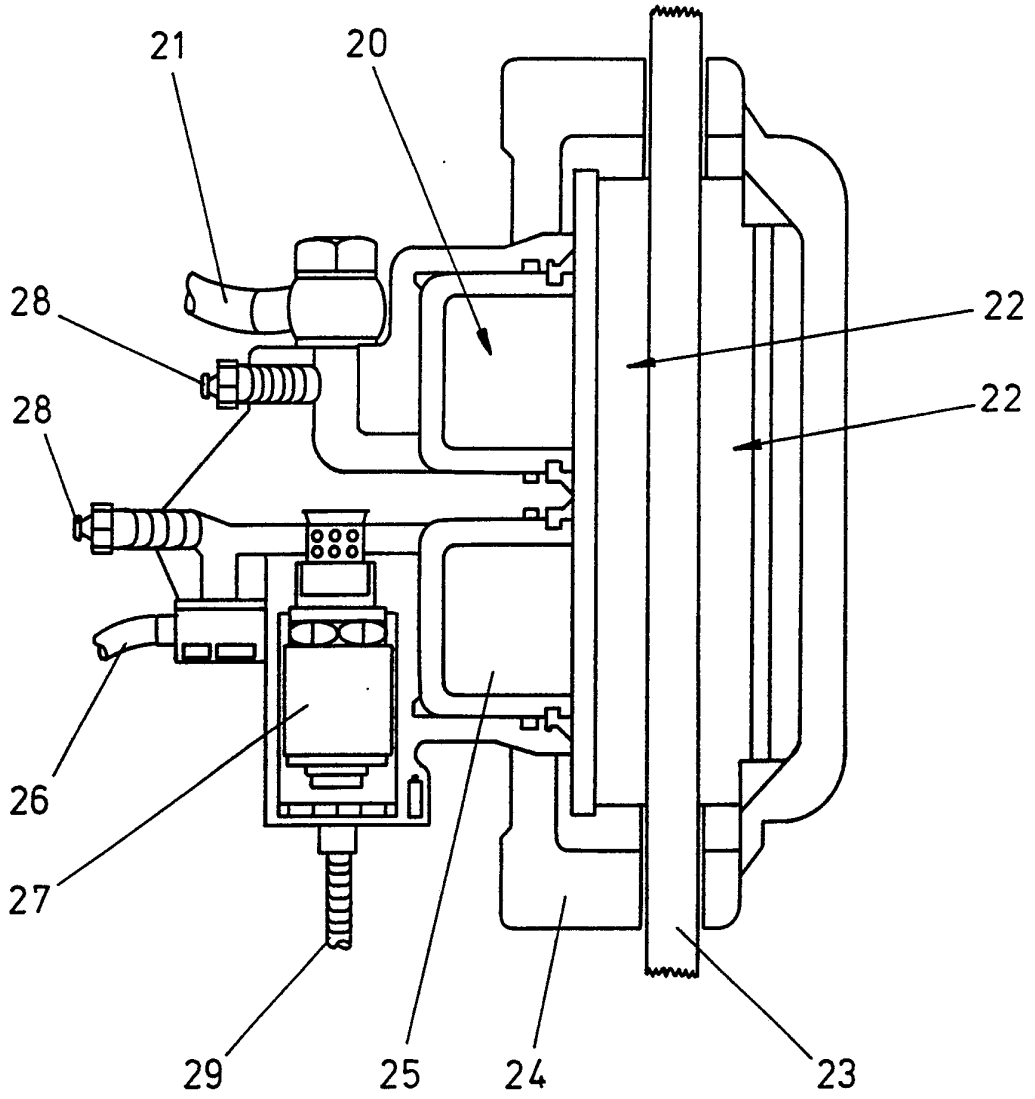

FIG. 2

INTERNATIONAL SEARCH REPORT

International Applicatic..No PCT/GB 91/00902

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)[6]

According to International Patent Classification (IPC) or to both National Classification and IPC

Int.Cl.5 B 60 R 25/08 B 60 T 11/10

II. FIELDS SEARCHED

Minimum Documentation Searched[7]

Classification System	Classification Symbols
Int.Cl.5	B 60 R B 60 T

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched[8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT[9]

Category °	Citation of Document,[11] with indication, where appropriate, of the relevant passages[12]	Relevant to Claim No.[13]
Y	GB,A,2201207 (LUCAS INDUSTRIES PLC) 24 August 1988, see the abstract; figures 1,2; page 2, line 16 - page 3, line 8; page 5, line 11 - page 8, line 3; claims	1-5,8
Y	GB,A,2035486 (CLEAL) 18 June 1980, see the whole document	1-5,8
A	US,A,4565265 (WOOLLEY) 21 January 1986, see the abstract; figure; column 2, line 42 - column 3, line 55	1,7
A,P	WO,A,9006248 (BINDER) 14 June 1990, see figures 2,5; page 1, line 27 - page 3, line 12; page 4, lines 4-13; page 5, line 9 - page 6, line 6; claims (cited in the application)	1,2,4-8

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IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
02-09-1991	07. 10. 91
International Searching Authority: EUROPEAN PATENT OFFICE	Signature of Authorized Officer: Mme Dagmar FRANK

Form PCT/ISA/210 (second sheet) (January 1985)

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO. GB 9100902 SA 48168

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 24/09/91
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB-A- 2201207	24-08-88	None	
GB-A- 2035486	18-06-80	None	
US-A- 4565265	21-01-86	None	
WO-A- 9006248	14-06-90	AU-A- 4756790	26-06-90