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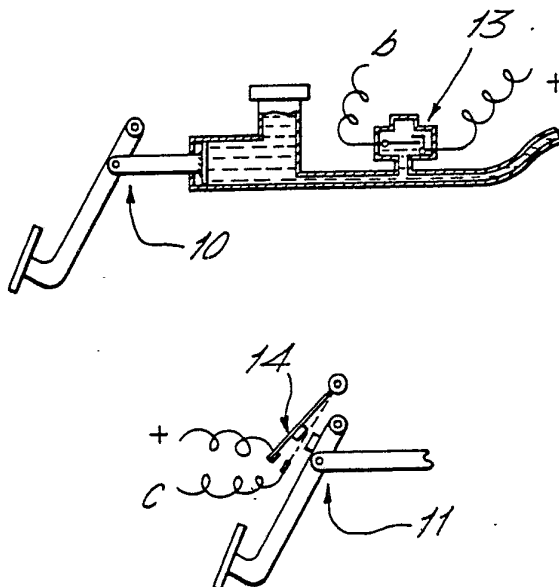
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With international search report.

(54) Title: DEVICE FOR MAINTAINING A VEHICLE STATIONARY

(57) Abstract

In order to prevent a vehicle having an automatic gearbox from creeping forward a device is provided which detects when both the vehicle is substantially stationary and the driver has his foot off the accelerator (11) and increases the braking pressure or locks the transmission. Optionally the device only operates when the driver has his foot off of the brake pedal (10) and a time delay may be built in so that the required conditions have to persist for a present time before the device operates. The device also has application to manual cars e.g. to assist in hill-starts.



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Title:Device for maintaining a vehicle stationary.Field of the Invention:

This invention relates to a device for maintaining a vehicle in a stationary condition.

Prior art:

Almost all road vehicles are equipped with steering, braking and accelerator controls, being coupled to mechanisms for carrying out these functions. Those fitted with manual transmission also require the use of a clutch and gear change mechanism, during normal driving.

A limitation of these mechanisms is that a driver not only must exercise control when driving, but also, in certain conditions, must exercise such control when the driven vehicle is stationary. For example, if the vehicle is arrested on an incline, braking pressure must of course be exerted, either by means of a hand or foot brake. In heavy traffic, repetitive use of these controls may be tiresome. Similarly, with regard to vehicles equipped with automatic transmission and torque converters, a well known feature of such vehicles is their tendency to creep forwards unless braking pressure is applied, even when the vehicle is arrested on level ground. Furthermore, as is well known, 'hill-starts' performed in vehicles having manual transmission, require skill in the manipulation of clutch, accelerator and hand-brake.

Object of the Invention

A primary object of the present invention is to reduce or eliminate the above problem, although as will become apparent from the following description the invention may also be applied to cars having manual gearboxes.

Summary of the Invention

According to the present invention, there is provided for use in a vehicle having a transmission and accelerating and braking mechanisms, a device for maintaining the vehicle in a stationary condition characterised in that it comprises first means for producing an output signal responsive to the

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concurrent existence of at least two detected conditions, including the conditions that the vehicle is substantially stationary and there is no effective activation of the accelerating mechanism, and second means responsive to the output signal and adapted to act on the transmission or braking mechanism to maintain the vehicle in a stationary condition.

The first means, in producing the output signal may additionally be responsive to the absence of the driver's actuation of the braking mechanism.

The device may include means for detecting the road speed of the vehicle and for providing a signal, indicating that the vehicle is stationary to the first means when the detected road speed is below a predetermined value. The detecting means may include a transducer responsive to rotation of a road wheel of the vehicle or rotation of a component of the transmission whose speed bears a one to one relationship with road speed.

The device may be adapted for use with a vehicle having a speedometer and include a switch controlled by the speedometer to indicate that the vehicle is stationary.

The second means may include an electromechanical actuator adapted to vary the braking pressure of the braking mechanism. For use with a vehicle having a fluid operated braking mechanism, the actuator may be adapted to act on the master cylinder.

In another embodiment the second means may include an electromechanical actuator adapted to selectively prevent rotation of a transmission component.

In all embodiments of the invention the arrangement may be such that the output signal from the first means is produced after a predetermined delay after the required conditions are established.

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Thus, in a vehicle equipped with this invention, once the vehicle is arrested, whether on an incline or not, as soon as the driver releases effective pressure on the braking and or accelerator systems, the vehicle is maintained stopped. The driver need not exert and maintain pressure for example on the foot and/or hand brake, and the procedure associated with hill starts is simplified.

In one embodiment of the invention, the second means may comprises an electromagnetic or hydraulic actuator for exerting pressure on the braking system of the vehicle. In an alternative embodiment, the said means may comprise means for engaging the transmission of the vehicle to indirectly prevent rotation of the road wheels normally driven thereby. For example, in the case of vehicles fitted with automatic transmissions, this may take the form of an actuator for engaging the 'parking' position pawl normally associated with such transmissions.

In accordance with legal requirements, most vehicles are fitted with braking systems, which, once pressure is applied thereto, cause a pressure-sensitive or brake position sensitive switch to complete a circuit and so to illuminate braking warning lights. In a feature of the invention, a signal indicating absence of effective activation of the braking system is conveniently obtained directly from detection of the absence of completion of the circuit. (This second signal operates a self locking bi-stable latch.)

In a further feature, a micro-switch positioned to detect the rest position of an accelerator pedal of the vehicle is used to provide the aforementioned said third signal indicating absence of pressure applied thereto. A micro-switch may also be used, instead of the brake pressure sensitive switch, to indicate absence of effective actuation of the brake pedal.

In the above mentioned first embodiment of the invention, in which an actuator is used for exerting pressure on the braking systems of the vehicle, where such pressure is exerted on the fluid hydraulic system, the brake indicator lights will automatically be retained illuminated. (The self

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locking latch circuit ensures that the actuator remains energized.) Pressure on the accelerator is therefore required to release the automatic braking mechanism, so breaking the latch circuit causing operation of the actuator, as well as resetting the latch.

A signal indicating movement of the vehicle may be provided in a number of ways. In a preferred form, the signal is derived from a transducer arrangement positioned to detect rotation of the transmission or one or more of the road wheels of the vehicle. In a further form, the signal may be provided by the completion of a circuit responsive to the speed detected by the existing speedometer of the vehicle, for example, by detection of the displacement of the speedometer indicator.

Brief description of the drawings:

The invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Fig 1 i)-iv) shows schematically accelerator and braking controls of a vehicle embodying the invention and circuitry associated therewith,

Figs 2a, 2b, show two possible forms of actuator for controlling movement of a vehicle embodying the invention and

Fig 3 is a schematic diagram of a timing circuit used within the invention.

Description of illustrative embodiments:

Referring to Fig 1, braking and accelerator controls of a vehicle are schematically indicated at 10 and 11. A speedometer of the vehicle is shown at 12. Exertion of braking pressure on the control 10, is indicated by means of the closure of a pressure sensitive switch 13. This switch is used to fulfill two purposes, the first being to provide activation of a braking warning light system of the vehicle (not shown) and the second being to provide a signal 'b', when closed, to the NOR gate shown in Fig 1 iv).

A microswitch 14 is positioned adjacent to the accelerator control 11, for detecting the position thereof. (This switch may be positioned elsewhere within the vehicle on

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a convenient part of the accelerator linkage). The micro-switch provides a signal 'c'. In one embodiment of the invention, a signal 'a' is provided by a contact arrangement within the speedometer 12, indicating displacement of the speedometer needle from its rest position, and therefore movement of the vehicle.

The three signals, a, b and c are supplied to the OR inverter gate shown in Fig 1 iv), the output of which remains passive unless all three signal are absent.

The action of the controls and circuitry associated therewith is as follows. During normal driving, use is continuously made of course of the accelerator and braking systems of a vehicle. In the majority of cases, it is also necessary to use the braking systems of the vehicle once it has been stopped to maintain it so, either because the vehicle is on an incline or, in the case of vehicles fitted with automatic transmission, because such transmission systems tend to cause the vehicle to creep forwards even on level surfaces.

In a vehicle embodying the present invention, the circuitry associated with the controls and speedometer provides an active output signal from the inverted OR gate of Fig 1, only when the vehicle is substantially stationery, and no substantial pressure is applied to both the brake and accelerator controls. In other words, once the driven vehicle has been stopped, and no influence thereon is made by the driver, an output signal indicating this condition is given, by virtue of the fact that none of the three signals a, b or c is present.

Use of this output signal is made to energize an actuator for maintaining the vehicle of the invention in a stopped state. Thus a driver need not exert any control over his vehicle once it has been brought to a stop, as this function is automatically accomplished. However, as soon as the accelerator (or brake) is applied, the 'self-locking' bistable circuitry 3 is disabled, and the vehicle is free to move again. In heavy traffic, or in hilly terrain, this arrangement may be especially advantageous, but besides these considerations, the safety of a vehicle so equipped is improved in that inadvertant movement such as rolling forwards

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or backwards into other objects once stopped, is prevented. Furthermore, in the case of vehicles equipped with the invention and a manual gearbox, the clutch of the vehicle may be partially engaged by a driver carrying out a hill-start, simultaneous with application of pressure on the accelerator, so in turn automatically releasing the aforementioned mechanism used to maintain the vehicle stationery. This arrangement makes easier 'hill-starts', as will be appreciated, as use of a hand brake is unnecessary.

Referring now to Figs 2a, 2b, two forms of actuator for maintaining the vehicle stationery are shown at 15 and 15'. Each is responsive to the active output signal of the inverted OR gate of Fig 1. (Relay or thyristor circuitry, not shown, is provided to enable the low-power elements of Fig 1 to drive the relatively high-power actuators.) With reference to the actuator designated 15, the vehicle is maintained stationery by means of a plunger 16, which forms the core of an electromagnet 18, exerting pressure when energised, on a suitably adapted vehicle braking system. (The U slots in the master cylinder arm 17, allow for movement of both the brake pedal, and/or the plunger 16, which therefore acts directly on the braking system of the vehicle.) It will be appreciated that the pressure required is only that needed to maintain the vehicle stationery, thus the force required of the electromagnet actuator is considerably less than that to be provided by a driver in actually arresting the vehicle.

In the case of the other form 15' of the actuator, energisation of the electromagnet 19 causes engagement of a lug 20 with the transmission shaft or gears of the vehicle, represented by the cog 21, so preventing rotation in turn of the wheels driven thereby, and thus movement of the vehicle.

In an alternative scheme, not shown, for vehicles fitted with brake-servo systems, braking pressure is applied by means of an electromagnetically controlled valve interacting with the brake servo-system, so directly regulating, in suitable manner, the brake vacuum pressure.

A timing network for indicating the speed of a vehicle embodying the invention is now described with reference to Figs 2b and 3, as an alternative to the speedometer arrange-

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ment shown in Fig. 1, i).

Referring first to Fig 2b, an electromagnetic sensor is depicted at 22 for sensing the rate at which teeth on the cog 21 (which for convenience, represents generally the rear transmission of the vehicle) pass thereby. Pulses from this sensor are fed to a comparator timing network, shown at 23 in Fig 3. (A schematic representation of such a train of pluses is shown at 24. The frequency and mark/space ratio of the pulses varies, obviously, according to the speed of the vehicle.) The object of the network is to determine once the rate of pulses falls below a predetermined threshold or stops altogether, so indicating that the vehicle has, effectively, been stopped. Once detection of this condition is obtained, the output of the network 'a' becomes inactive, so switching on the actuator 17 once signal 'b' and 'c' also become inactive, as described earlier. In vehicles fitted with anti-skid means the signal a may be obtained from existing circuits.

In a simplified alternative form of the invention, the braking pressure signal b may be omitted, the actuator signal being derived solely from the speed of the vehicle and the position of the accelerator. In this arrangement, the vehicle is maintained stopped, once stopped, regardless of the position of the brake pedal. A switch may be connected into the circuitry for disabling the facility at the driver's discretion.

With regard, however, to the realization in which all three signals are utilized, a small delay may be incorporated within the circuit shown in Fig 3, to prevent immediate actuation of the automatic braking system once detection of absence of road speed and or pressure on the controls of a vehicle is detected. Thus, in the event of a skid, in which no rotation of the road wheels is detected immediately on relieving brake pressure, the road wheels are given an opportunity to rotate, so indicating movement of the vehicle to the actuator system and in turn preventing operation thereof.

Numerous modifications will be apparent to those skilled in the art, in the manner of implementing the concepts of the invention.

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CLAIMS

1. For use in a vehicle having a transmission and accelerating and braking mechanisms, a device for maintaining the vehicle in a stationary condition characterised in that it comprises first means for producing an output signal responsive to the concurrent existence of at least two detected conditions, including the conditions that the vehicle is substantially stationary and there is no effective activation of the accelerating mechanism, and second means responsive to the output signal and adapted to act on the transmission or braking mechanism to maintain the vehicle in a stationary condition.

2. A device according to claim 1 characterised in that the first means, in producing the output signal, is additionally responsive to the absence of the driver's actuation of the braking mechanism.

3. A device according to claim 2 for use with a vehicle having a driver-operable brake actuator, characterised by a detector responsive to the condition of the brake actuator.

4. A device according to claim 1 2 or 3 and characterised by means for detecting the road speed of the vehicle and for providing a signal, indicating that the vehicle is stationary to the first means when the detected road speed is below a predetermined value.

5. A device according to claim 4 characterised in that said detecting means includes a transducer responsive to rotation of a road wheel of the vehicle or rotation of a component of the transmission whose speed bears a one to one relationship with road speed.

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6. A device according to any one of the preceding claims for use with a vehicle having a speedometer and characterised by a switch controlled by the speedometer to indicate that the vehicle is stationary.

7. A device according to any one of the preceding claims characterised in that the second means includes an electromechanical actuator adapted to vary the braking pressure of the braking mechanism.

8. A device according to claim 7 for use with a vehicle having a fluid operated braking mechanism having a master cylinder and characterised in that the actuator is adapted to act on the master cylinder.

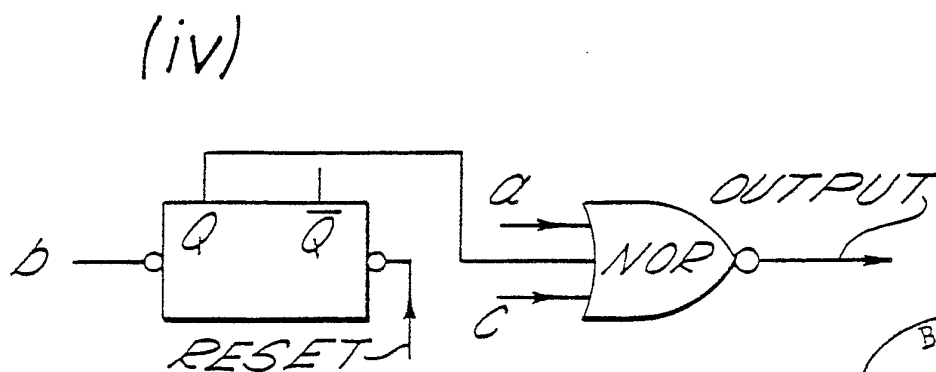
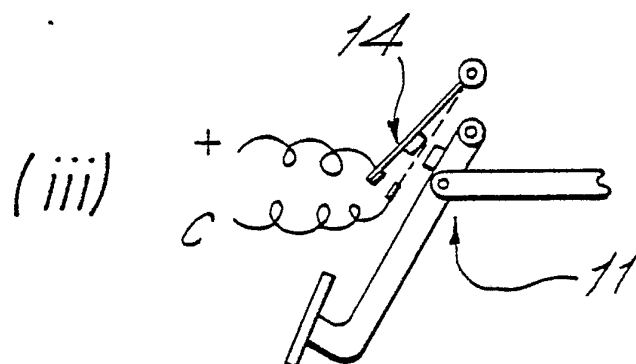
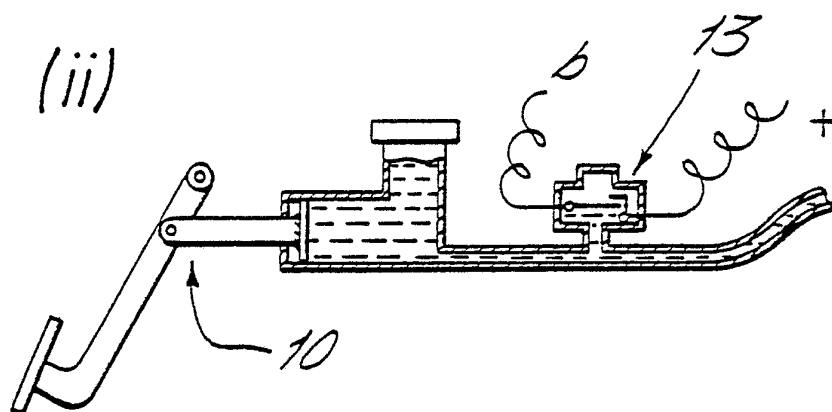
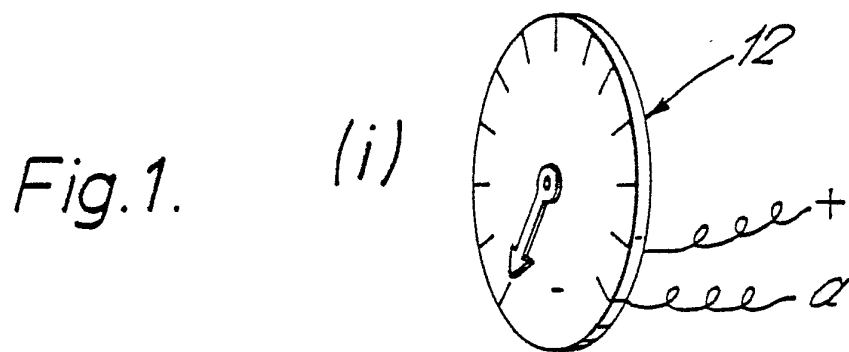
9. A device according to any one of the preceding claims characterised in that the second means includes an electromechanical actuator adapted to selectively prevent rotation of a transmission component.

10. A device according to any one of the preceding claims characterised in that the arrangement is such that the output signal from the first means is produced after a predetermined delay after the required conditions are established.

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(a)

Fig.2.

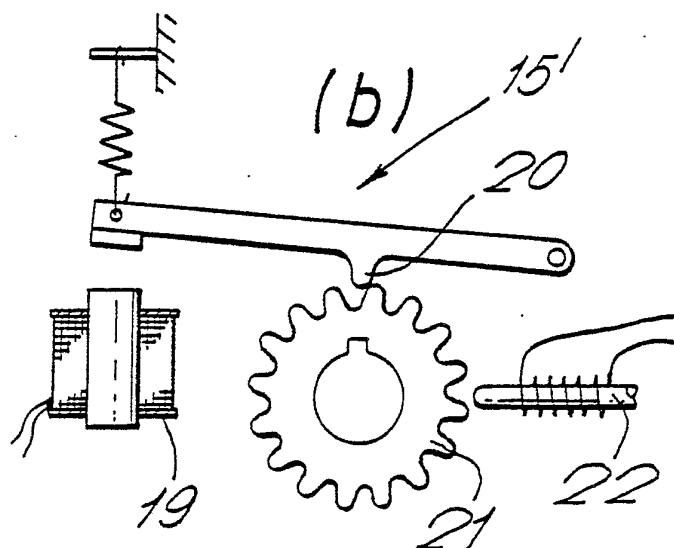
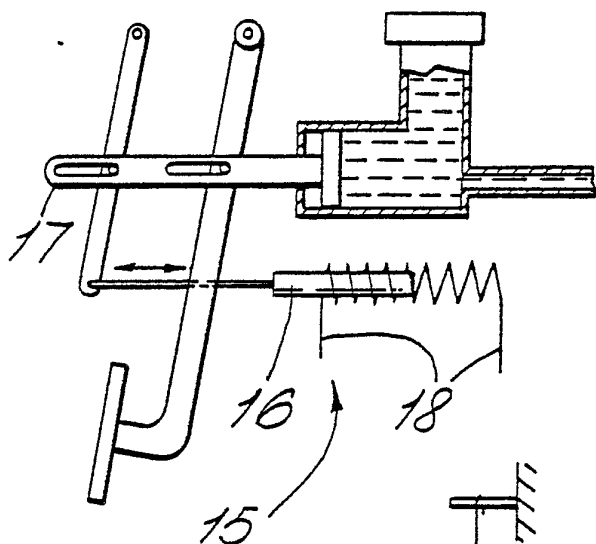
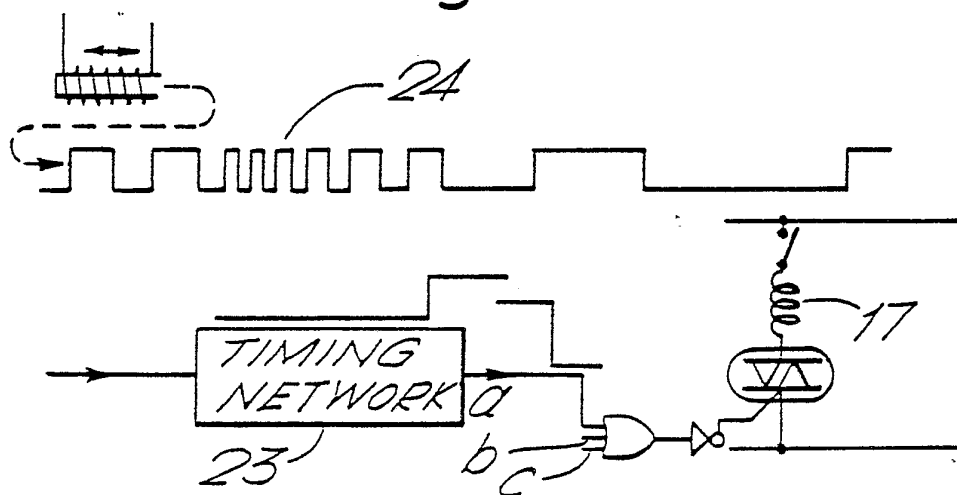


Fig.3.



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INTERNATIONAL SEARCH REPORT

International Application No. PCT/GB 81/00273

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ³

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

IPC³: B 60 T 7/12; B 60 K 41/20

II. FIELDS SEARCHED

Minimum Documentation Searched ⁴

Classification System

Classification Symbols

IPC³

B 60 T; B 60 K

Documentation Searched other than Minimum Documentation
to the extent that such Documents are included in the Fields Searched ⁶

III. DOCUMENTS CONSIDERED TO BE RELEVANT ¹⁴

Category [*]	Citation of Document, ¹⁶ with indication, where appropriate, of the relevant passages ¹⁷	Relevant to Claim No. ¹⁸
X	US, A, 3895698 (FONTAINE) 22 July 1975 see claims; figures 1-3 --	1-5, 7, 8
X	US, A, 3763975 (FONTAINE) 9 October 1973 see claims; figure 1 --	1, 4, 5, 10
X	US, A, 4076093 (MIZUND) 28 February 1978 see claims; figures 1-12 --	1, 2, 3, 4, 7, 8
X	US, A, 3593815 (INOVE) 20 July 1971 see claims; figures 5, 7 --	1, 4, 5
X	US, A, 2734590 (HAYS) 14 February 1956 see claims; figures 1-11 --	1, 6
X	US, A, 2381755 (JAMESON) 7 August 1945 see claims --	1
X	US, A, 2272320 (FREEMAN) 10 February 1942 see claims; figures 1-5 -----	1

* Special categories of cited documents: ¹⁵

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"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search ¹

8th March 1982

Date of Mailing of this International Search Report ²

19th March 1982

International Searching Authority ¹

EUROPEAN PATENT OFFICE

Signature of Authorized Officer ²⁰

G. C. X. [Signature]

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