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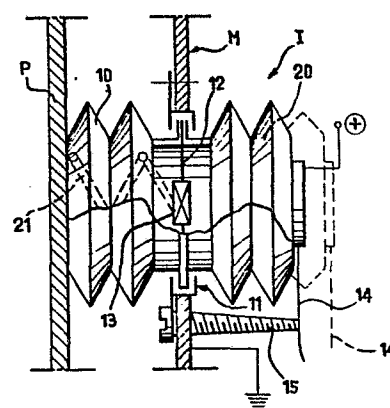
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54 **Pneumatically controlled delay switch.**

57 A pneumatically controlled delay switch for passenger car courtesy lamps comprises first (10) and second (20) elastically deformable pneumatic chambers separated by a portion (12) including a differential valve (13) effective to allow a slow transfer from the first (10) to the second (20) chamber of the air contained in the system as the first chamber is squeezed by the closing movement of a vehicle door and a quick return to the starting rest configuration as the pressure is relieved from the first chamber (10). Upon completion of the air slow transfer from the first (10) into the second (20) chamber, a movable electric contact (14) associated with the second chamber (20) disengages from a corresponding fixed contact (15) associated to the upright (M) of the vehicle door (P) to open the lamp supply circuit.

Fig. 2



This invention relates to a pneumatically controlled delay switch, particularly for passenger car and motorvehicle courtesy lamps, the term "courtesy lamp(s)" referring herein to lamps which
5 are usually mounted in a vehicle passenger compartment and turned on upon opening at least one door thereof and off upon closing the same.

The invention is essentially directed to providing a delayed action switch, that is one effective to
10 turn the lamps off with a short time delay after the vehicle door has been closed, in order to keep the vehicle interior lighted for a sufficient time duration to insert the ignition key or perform other comparable functions after the door of the vehicle
15 has been closed.

Known in the art are delay switches adapted for turning the courtesy lamps off after the doors have been closed which are based upon the utilization of bimetal timers, or of monostable electronic circuits
20 with time constants which can be preset as desired.

However, the use of such known switches has shown to be disadvantageous, on one hand owing to the disproportionate cost to the function they are to perform, and on the other hand on account of the
25 excessively complicate construction of such switches, which makes them liable to failure particularly because they are installed at locations on the vehicle body where they are exposed to weather, dirt, dust, and the like contaminating agents.

It is a primary object of this invention to eliminate all such disadvantages by providing a delay switch as indicated, which has an extremely simple construction, is relatively inexpensive,
5 can be installed with the utmost ease and without involving any alteration of the existing electric circuitry, is reliable in operation, and especially impervious to weather.

According to the invention, these and other
10 objects, such as will be apparent hereinafter, are achieved by a delay switch characterized essentially in that it comprises first and second elastically deformable pneumatic chambers, separated by a partition including a differential valve adapted for
15 allowing a slow transfer from the first into the second chamber of the air contained in the system upon the first chamber being squeezed by the closing movement of a vehicle door and quick return to the initial rest configuration as said first chamber is
20 relieved of such pressure, the second chamber having a movable electric contact which disengages from a corresponding fixed contact to open the electric circuit with the second chamber in the maximum inflation condition thereof, substantially upon
25 completion of said slow transfer of air from the first into the second chamber.

Advantageously, according to the invention, said differential valve comprises a pair of overlaid membranes having markedly different elastic properties,
30 the stiffer membrane being formed with at least one

hole shut off by the more elastic membrane which, with the direction of the transfer airflow occurring from the first into the second chamber is urged to closely adhere against said hole, thus enabling the transfer to occur by leakage or bleeding, and with the transfer airflow occurring in the opposite direction, disengages from said hole to allow a fast return of the air from the second into the first chamber.

Further features and advantages will be more apparent from the following detailed description, with reference to the accompanying drawings, where:

Figure 1 is a perspective view of a passenger car showing the location of the inventive switch thereon;

Figure 2 is a schematical longitudinal section of said switch; and

Figure 3 is a detail view of a differential valve advantageously suitable for use in the switch of this invention.

In the drawing figures, the character I designates generally this delay switch as intended for installation on a fixed portion of a passenger car body, such as the upright M of the door P, at such a position as to be engaged by the door when the latter is in its closed condition and disengaged therefrom with the door in the open condition.

The delay switch, which comprises two pneumatic chambers 10-20, respectively called first chamber and second chamber hereinafter, is installed with the

first chamber 10 on the upright exterior and the second chamber 20 on the upright interior, the first chamber being, therefore, the one to be engaged by the door, which squeezes it to a configuration of least volume. The two chambers, which are advantageously formed from an elastomeric material, are of preference made in the form of a bellows and interconnected in airtight sealed and overlapping relationship, as through a preferably metal ring nut 11 which also serves for connecting the switch to the metal sheet portion of the upright M. Between said chambers, and clamped tightly by the action of the ring nut 11, there intervenes a partition diaphragm 12 incorporating a differential valve schematically indicated at 13 in Figure 2. The function of said valve is of allowing a slow transfer of the pneumatic fluid -- contained in the system made up of the two chambers -- from the first into the second chamber when said first chamber is engaged and squeezed by the door P, and a fast return of the fluid in the opposite direction, namely from the second into the first chamber, when the latter, being disengaged from the door, tends to recover its original configuration.

To the second chamber, there is attached a movable contact comprising an elastically yielding metal reed 14 and being adapted to cooperate with a ground rheophore 15, advantageously including a screw arranged on the upright M adjacent the switch I. The arrangement is such that when the chambers 10 and 20 are both in their rest condition, corresponding to

an equal pressure of the pneumatic fluid contained therein, the contact 14 will engage the rheophore 15 to close the circuit which turns the courtesy lamps on; said configuration being the one which corresponds
5 to the open condition of the door P. By converse, when the door is closed, it will deform the first chamber 10 with a squeezing action, thus producing an increase of pressure of the air contained in it and a resulting transfer of air from the first into
10 the second chamber, with a slowed down flow under control by the valve 13. The second chamber 20 is, therefore, slowly deformed until it produces the separation of the reed 14 from the rheofore 15 and consequent breaking of the lamp circuit, thereby the
15 lamps are turned off; the switch off time delay being proportionate to the flow rate through the valve 13 for the air transfer direction from the first into the second chamber.

The above-described operation is advantageously
20 accomplished by utilizing a valve 13 as shown in Figure 3, where it may be noted that said valve comprises first and second membranes 16, respectively 17, in overlapped relationship. The membranes, which are both formed from an elastically yielding material,
25 have markedly different thickness dimensions and, accordingly, elastic properties. The membrane 16, which is the thicker one, has moderate elastic properties and serves for dampening any pressure surges produced in slamming the door shut. The
30 membrane 17, which is much thinner, overlies the

former to shut off at least one hole 18 provided in the latter membrane, but such as to allow the air to bleed past it, as indicated by the arrows F, from the chamber 10 (on the left of the membranes in
5 Figure 3) into the chamber 20. This may be accomplished by surrounding the hole 18 with a series of radial grooves, as indicated at 19, of very small cross-sectional area.

It will thus be appreciated that an increase
10 of the pressure within the chamber 10 will tend to urge the membrane 17 against the membrane 16, thereby the air transfer is caused to occur slowly by a bleeding effect, whereas the reverse return flow occurs very rapidly thanks to the raising of the
15 membrane 16, which completely uncovers the opening of the hole 18. To facilitate said fast return flow, it is advantageous that, at least in the chamber 10, a coil spring 21 be provided which would tend to bring the bellow of said chamber back to its rest
20 or relaxed position.

Of course, the effects of the instant application also extends to any other designs which achieve the same results through the same basic principles.

CLAIMS

1 1. A pneumatically controlled delay switch,
2 particularly for passenger car courtesy lamps,
3 characterized in that it comprises first (10) and
4 second (20) elastically deformable pneumatic chambers,
5 separated by a partition (12) including a differential
6 valve (13) adapted for allowing a slow transfer from
7 the first (10) into the second (20) chamber of the
8 air contained in the system upon the first chamber (10)
9 being squeezed by the closing movement of a vehicle
10 door (P) and quick return to the initial rest configu-
11 ration as said first chamber (10) is relieved of such
12 pressure, the second chamber (20) having a movable
13 electric contact (14) which disengages from a
14 corresponding fixed contact (15) to open the electric
15 circuit with the second chamber (20) in the maximum
16 inflation condition thereof, substantially upon
17 completion of said slow transfer of air from the first
18 (10) into the second (20) chamber.

1 2. A delay switch according to Claim 1, wherein
2 said first chamber (10) is adapted for engagement by
3 the vehicle door (P), said door (P) squeezing said
4 first chamber (10) to a configuration of least volume
5 thereof.

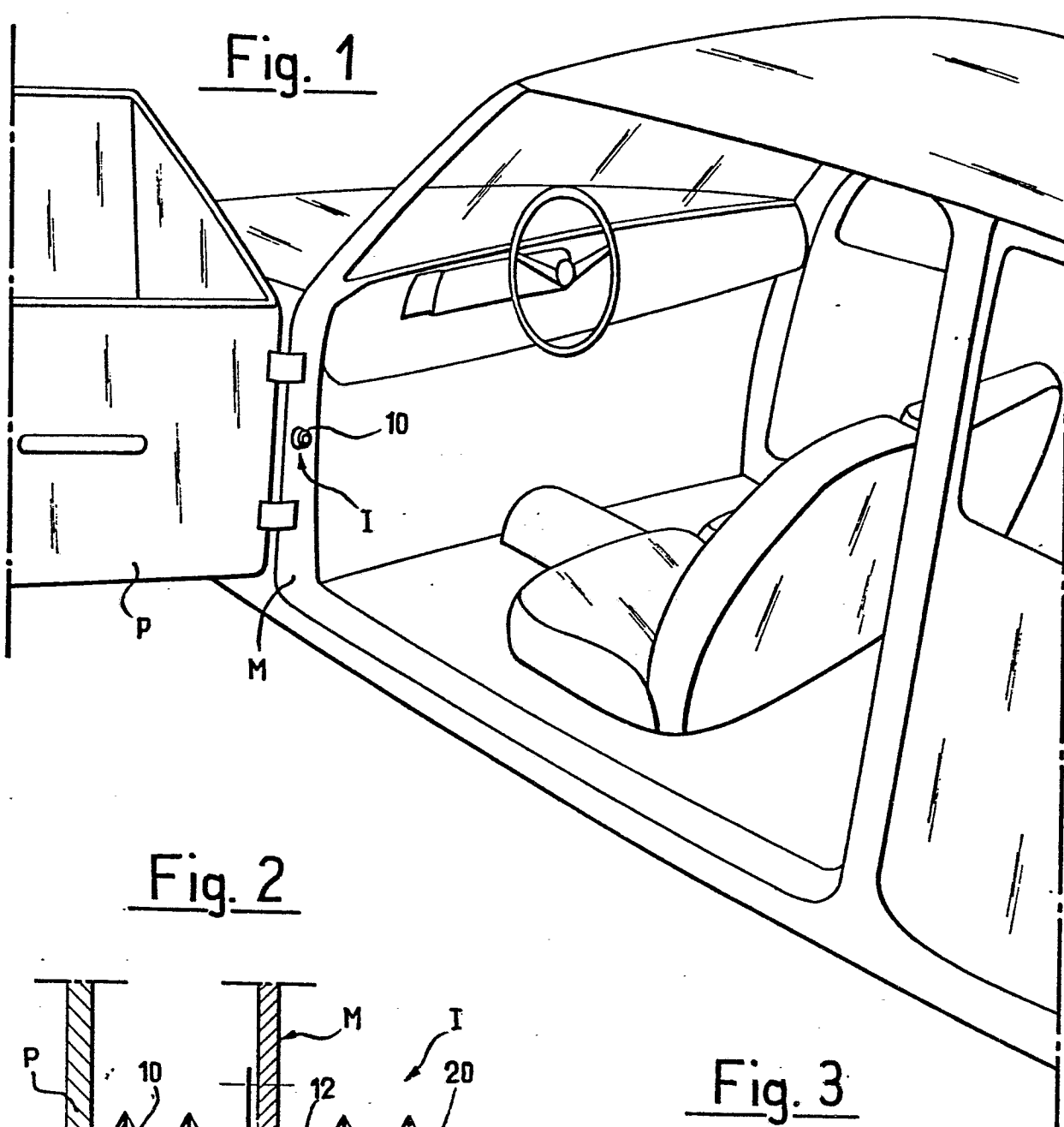
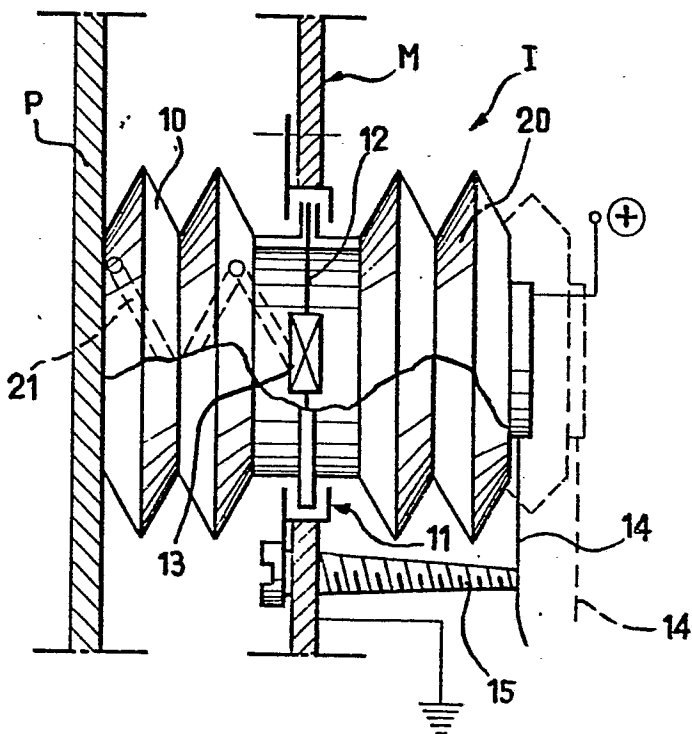
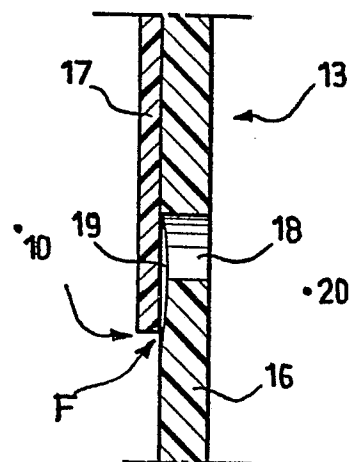
1 3. A delay switch according to Claims 1 and 2,
2 wherein said first and second chambers (10, 20) are
3 formed from an elastically yielding material to a
4 bellow-like configuration.

1 4. A delay switch according to the preceding

2 claims, wherein said first and second chambers (10, 20)
3 are interconnected in an airtight sealed and overlapping
4 relationship through a ring nut (11), a partition (12)
5 incorporating said differential valve (13) being
6 interposed between said chambers (10, 20) and clamped
7 sealingly by said ring nut (11).

1 5. A delay switch according to the preceding
2 claims, wherein said movable contact (14) carried in
3 said second chamber (20) comprises a metal reed (14)
4 and said fixed contact (15) is a ground rheophore (15)
5 in the form of a screw located adjacent said switch.

1 6. A delay switch according to the preceding
2 claims, wherein said differential valve (13) comprises
3 a pair of overlapping membranes (16, 17) having
4 markedly different elastic properties, the stiffer
5 membrane (16) being formed with at least one hole (18)
6 adapted to be shut off by the more elastic membrane (17),
7 said more elastic membrane (17), for a transfer direction
8 of the airflow from the first (10) into the second (20)
9 chamber, being urged to adhere against said hole (18),
10 thereby the transfer is caused to occur by a bleeding
11 effect, and the opposite transfer direction, being
12 disengaged from said hole (18), thereby a quick return
13 of the air is enabled from said second (20) into said
14 first (10) chamber.

Fig. 1Fig. 2Fig. 3



European Patent
Office

EUROPEAN SEARCH REPORT

0043970

Application number

EP 81 10 5018

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
	FR - A - 2 130 544 (DAIMLER BENZ A.G.) ⌘ the whole document ⌘ --	1	H 01 H 13/18 9/24
A	US - A - 3 204 069 (WEST) ⌘ column 1, lines 9 to 15 ⌘ --	1	
A	US - A - 3 300 755 (DUNN) ⌘ the whole document ⌘ -----	1	TECHNICAL FIELDS SEARCHED (Int. Cl. ³) H 01 H 13/18 9/24 B 60 Q 1/00
			CATEGORY OF CITED DOCUMENTS
			X: particularly relevant A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: conflicting application D: document cited in the application L: citation for other reasons
			&: member of the same patent family, corresponding document
The present search report has been drawn up for all claims			
Place of search The Hague	Date of completion of the search 23-09-1981	Examiner ONILLION	