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Vidberg

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[54] **DEVICE FOR CONTROLLING THE FEEDING OF FUEL TO AN INTERNAL COMBUSTION ENGINE**

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[73] Assignees: **Automobiles Peugeot,** Paris; **Regie Nationale des Usines Renault,** Boulogne-Billancourt, both of France

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[51] **Int. Cl.** **F02b 77/00**

[58] **Field of Search**... 123/198 D, 198 DB, 198 DC; 180/82 R

[56] **References Cited**

UNITED STATES PATENTS

3,698,372	10/1972	Eshelman	180/82 R
3,722,491	3/1973	Malda	123/98
3,722,492	3/1973	Shibata	123/198 DB
3,731,667	5/1973	MacMillan	180/82 R

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[57] **ABSTRACT**

Comprising a throttle member, in an induction passage of a carburetor body, a control element actuated by the user and connecting means operatively interconnecting the throttle member and the control element. The connecting means comprise a spindle carrying the throttle member and a sleeve coaxial with the spindle and integral with the control element. The spindle and sleeve are relatively rotatable and the sleeve is rotatable in the carburetor body. An electromagnetic coupling normally interconnects the spindle and sleeve but is capable of disconnecting the spindle and sleeve in the event of malfunctioning of the device. Separate springs bias the spindle and the sleeve toward positions normally corresponding to a position of the throttle member substantially closing the induction passage.

10 Claims, 5 Drawing Figures

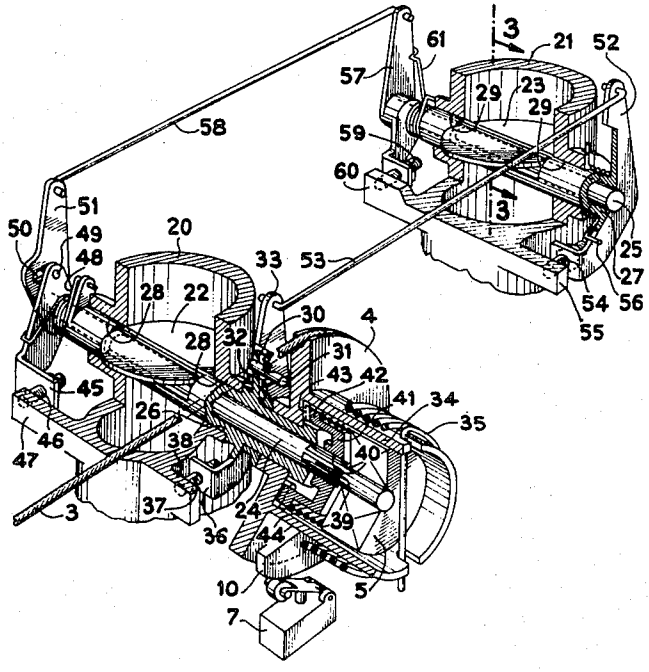

FIG. 3

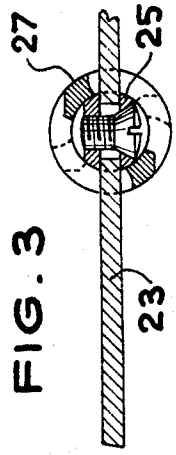

FIG. 1

FIG. 2

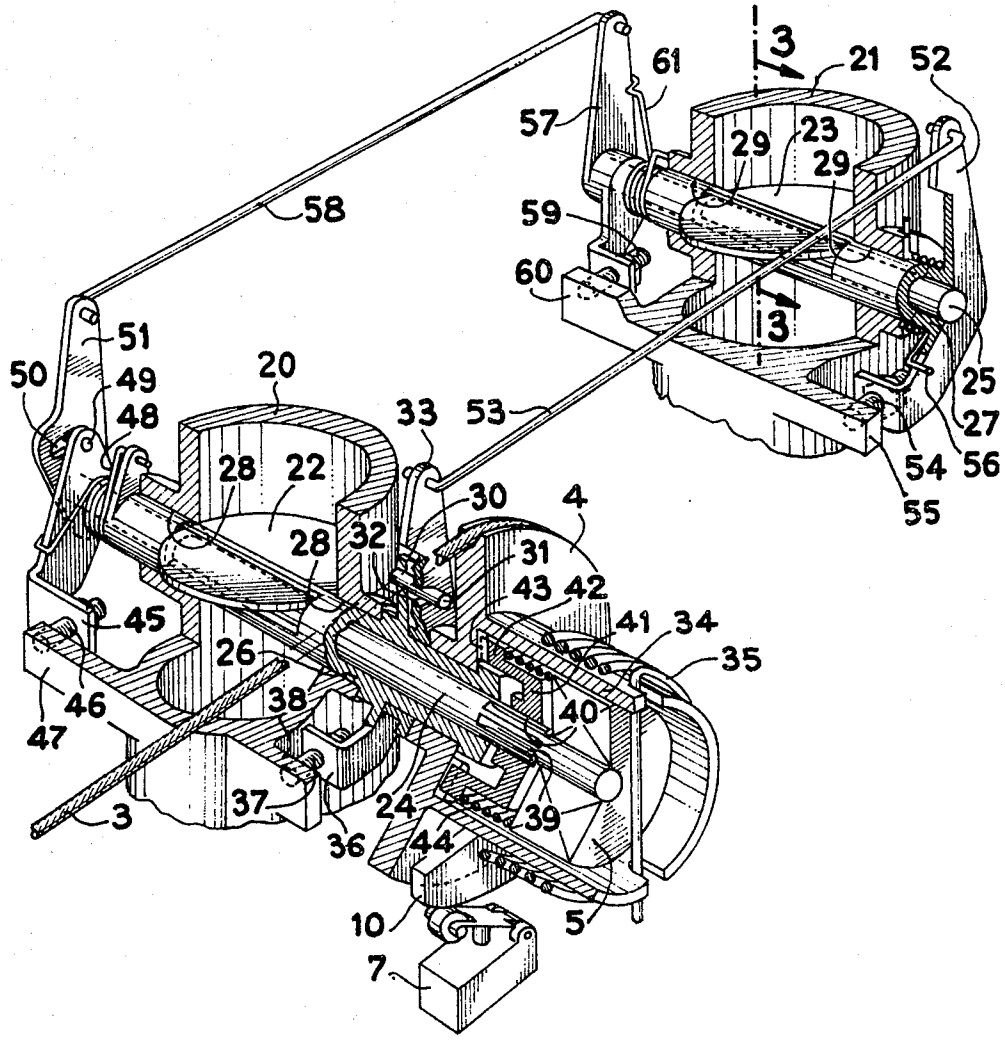
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FIG. 4

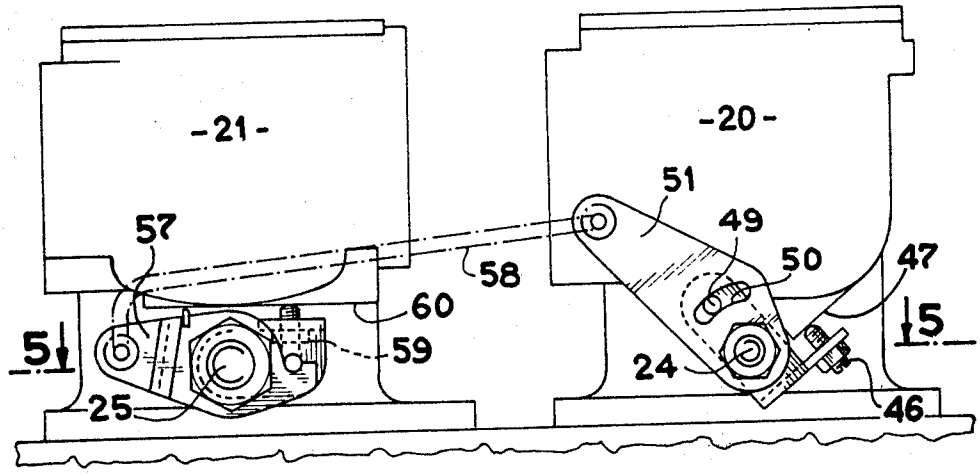
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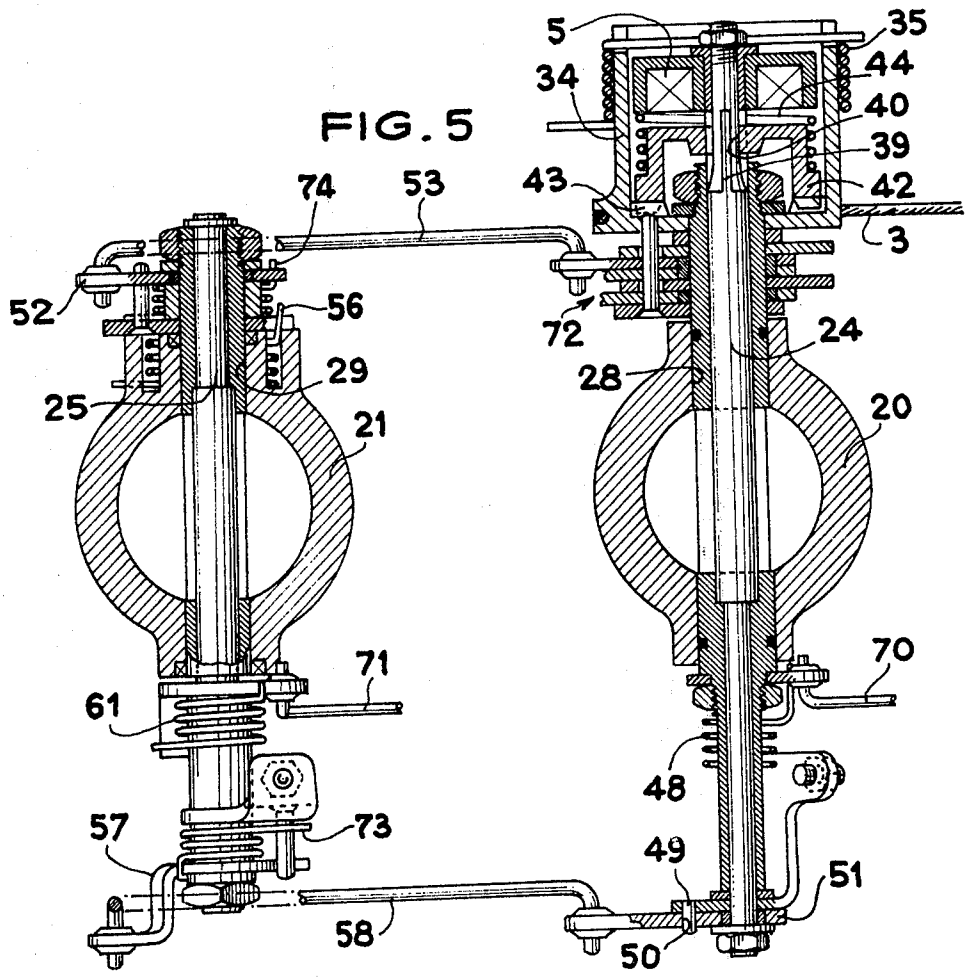
FIG. 5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DEVICE FOR CONTROLLING THE FEEDING OF FUEL TO AN INTERNAL COMBUSTION ENGINE

The present invention relates to devices for controlling the feeding of fuel to an internal combustion engine and in particular an engine equipped with at least one carburetor.

Control devices for a carburetor are known in which there is provided between the control element actuated by the user and the throttle member an electromagnetically-controlled coupling which, in the event of a breakdown in the transmission of the motion between the actuating element and the throttle member, is adapted to release the throttle member and allow its return to a position in the vicinity of the idling speed position under the action of a return spring. Such a device is simple in construction but does not permit avoiding all the dangers of the sticking of the throttle member in a partly or completely open position, this sticking being, for example, due to seizure or jamming of the spindle of the throttle member in the body of the carburetor. Now, such seizure does sometimes occur and may be such as to require a tool to free the two seized parts. It will be understood that in the event of such seizure, with the throttle member in the open position, the engine is continued to be fed with fuel whereas the user may have ceased to depress the accelerator pedal so that there is a definite hazard and a risk of a serious accident.

Some other malfunctioning may occur in the transmission of motion between the element actuated by the user and the throttle member, such as the sticking of the cable or linkage, or the unhooking of the return spring.

An object of the present invention is to preclude such malfunctioning and thereby improve the safety.

The invention provides a device for controlling the feeding of fuel to an internal combustion engine, comprising a fuel feed flow regulating means, resiliently yieldable means for returning said flow regulating means to its closing position, and a control element actuated by the user and connected to the regulating means through connecting means including an electromagnetically controlled coupling, wherein the regulating means is carried by a first member and the control element is connected to a second member, said two members are concentric and interconnected in the position for normal operation by the coupling, and a separate resiliently yieldable return means is provided for each of said members.

According to one embodiment of the invention, the control element actuated by the user is integral with a sleeve rotatably mounted in a fixed body and the regulating means for the throttle member is integral with a spindle rotatably mounted in the sleeve, the coupling is disposed in the vicinity of two adjacent ends of the spindle and the sleeve, and the resiliently yieldable return means act respectively on the sleeve and on the spindle.

According to another feature of the invention, two idling speed control screws respectively associated with the sleeve and the spindle are provided, the adjustment of the screws being preferably slightly staggered.

The invention can be of course applied to the case of a single or duplex carburetor, provided that in case of the duplex carburetor a certain number of adaptations are made which will be more clearly apparent from the

ensuing description with reference to the accompanying drawings in which:

FIG. 1 is a diagrammatic view of a control device according to the invention;

FIG. 2 is a perspective view, with parts cut away, of a first embodiment of the mechanical part of the device;

FIG. 3 is a sectional detail view taken on line 3—3 of FIG. 2;

FIG. 4 is a side elevational view of a second more elaborate embodiment of the device according to the invention, and

FIG. 5 is a sectional view taken on line 5—5 of FIG. 4.

FIG. 1 shows a control device comprising an accelerator pedal 1 which acts through a lever 2 on a cable 3 connected to a control element or sector 4 whose connection with the fuel regulating throttle member will be described in more detail hereinafter. The element 4 comprises an electromagnet 5 whose supply circuit connected to the battery 6 of the vehicle includes in series: two switches 7, 8 and a delay device 9, the switch 7 being controlled by a cam 10 integral with the control element 4 whereas the second switch 8 is controlled by the accelerator pedal.

The pedal is constituted by a plate 11 of synthetic material which is secured at its lower end 11*a* to the body of the vehicle and in which a portion 12 of reduced section constitutes a pivot. This plate receives on a lower surface a second rigid plate 13 which is maintained in a flexible manner by a foil or sheet 14 and carries the switch 8 whose push-member 15 bears against the accelerator pedal 1. A spring 16 maintains the switch in its normal position for closing the circuit.

With reference to FIG. 2, the mechanical part of the device will now be described in detail. In the illustrated embodiment the device is applied to a duplex or twin carburetor, but it will be understood that this arrangement is also applicable to a single carburetor. As shown, the two bodies 20, 21 of the duplex carburetor contain two throttle members 22, 23 integral with a spindle 24, 25 respectively. Each spindle is mounted to freely rotate in a sleeve 26, 27 which is apertured so as to permit the passage of the throttle member and is rotatably mounted in bearings 28, 29 formed in the bodies.

In the case of the main body 21 of the carburetor, the sleeve 26 is integral with the control element 4 shown in FIG. 1 and with a radial tab 30 integral with a lug or pin 31. This pin is received in an oblong aperture 32 formed in a lever 33 which is capable of rotating with respect to the sleeve. The control element defines on its side remote from the body of the carburetor a cylindrical sleeve 34 around which is wound a spring 35 which bears against the carburetor body and biases the assembly to the throttle-closing position. This control element also comprises the cam 10 acting on the switch 7 and a tab 36 on which an idling speed screw 37 is mounted. The screw 37 co-operates with a corresponding abutment 38 formed on the body of the carburetor.

The spindle 24 carrying the throttle member extends out of the sleeve 34 and has splines 39 co-operating with corresponding splines 40 provided on a cup 41 which is slidably mounted and comprises along its edge clutch portions 42, such as dog-clutch portions, which are normally engaged with clutch portions 43 of corresponding shape provided on the element 4. The end

portion of the spindle **24** is integral with the electromagnet **5** and, provided between the latter and the cup **41**, is a spring **44** which biases the cup toward the position in which the spindle **24** is coupled to the sleeve **26** integral with the element **4**.

At its opposite end, the spindle **24** is integral with a lever **45** also carrying an idling speed screw **46** which co-operates with a corresponding support surface **47** provided on the carburetor body, this lever being biased toward the closing position of the throttle member by a spring **48** reacting on the adjacent end of sleeve **26**. The lever also carries a pin or lug **49** received in an aperture **50** which has a shape corresponding to that of the aperture **32** and is formed in a plate or lever **51** which is rotatably mounted on the spindle **24** and is part of a connection with the second body **21** of the twin carburetor.

In the second body **21**, the sleeve **27** is integral with a lever **52** which is connected to the lever **33** through a rod **53** and also carries an idling speed screw **54** which co-operates with a corresponding support surface **55** provided on the body **21**. A spring **56** biases the sleeve **27** toward the position for closing the throttle member **23**.

The spindle **25** carrying the throttle member **23** is received in the sleeve **27** to rotate freely therein and carries a radial lever **57** connected through a rod **58** to the plate **51** and an idling speed screw **59** which co-operates with an abutment **60** on the second body **21** of the carburetor. Another spring **61** acts between the body **21** and the spindle and biases the latter to the position for closing the throttle member.

FIG. **3** shows in more detail the assembly of the spindle **25** of the second body of the carburetor with its sleeve **27**. As this spindle carrying the throttle member **23** is freely received in the sleeve, these two elements should be placed in such position that the throttle member is capable of effecting, in the case of malfunctioning, a rotation with respect to the sleeve so that it is able to move, for example, from a position of full opening to an idling speed position or a position in the vicinity of the idling speed position. For this purpose, it is sufficient to bring the sleeve in abutment with the throttle member which has already been adjusted by the screw **59** and thereafter turn the sleeve through a few degrees, so as to bring it to the position shown in FIG. **3**, by means of the screw **54**.

Before describing the operation of such a device, there should be mentioned the order in which the adjustments of the various idling speed screws are carried out. Bearing in mind that in normal operation the sleeve **26** and the spindle **24** of the first body **20** of the carburetor are rendered integral by the clutch portions **42, 43**, it is the screw **37** associated with the sleeve which performs the function of the idling speed screw and it is consequently this screw which is adjusted first. The idling speed screw **46** associated with the spindle **24** is then adjusted and slightly offset with respect to the screw **37** in the direction for decreasing the running speed of the engine. The screws **59, 54** associated with the second body **21** of the carburetor are then adjusted.

In normal operation, the spindle **24**, the throttle member **22**, the sleeve **26**, the control element **4** are integral with each other and constitute a moving assembly which is rotated with respect to the body **20** by the cable **3** which is shifted by the accelerator pedal **1**. This moving assembly is normally returned by the spring **35**.

It will be observed that, owing to the presence of the two concentric elements constituted by the spindle and the sleeve, no force of reaction is exerted on the body notwithstanding the presence of the spring **44** which acts axially so as to maintain the coupling **42, 43** in its operative motion-transmitting position. This feature is important since it avoids any risk of seizure or jamming between the throttle member **22** and the body **20** by taking up play by the internal reactions within the moving assembly.

After a given opening of the throttle member of the main body **20** of the carburetor, the pins **31, 49** abut the ends of the oblong apertures **32, 50** and thus bring the part of the carburetor associated with the second body **21** into action.

The switch **8** is adapted to be normally in its closed position and to open only when pressure exerted on the accelerator pedal depresses the push-member **15**. The switch **7** is only in its open position when the sector or the control element **4** has been returned to its position of rest or the idling speed position. If some defective operation occurs in the kinematic chain between the accelerator pedal and the throttle member, for example sticking of the cable **3**, unhooking of the main spring **35** or seizure of the spindle carrying the throttle member, and if the throttle member **22** is not in its idling speed position, the switch **7** is closed and, as soon as the user releases the pressure on the accelerator pedal, the switch **8** also closes. The circuit diagram shown in FIG. **1** is then closed and the electromagnet **5** is energized. This causes the coupling element **41** to slide in opposition to the action of the spring **44** and disengage the clutch portions **42, 43**. The spindle **24** is then released from its sleeve and the return spring **48** returns it to the idling speed position determined by the abutment of the screw **46** against the surface **47**. As concerns the second body **21** of the carburetor, bearing in mind that the spindle **25** carrying the throttle member **23** is free to move in the sleeve, the spring **61** returns this spindle to the idling speed position. The delay means **9** in the circuit avoids an excessively rapid operation of the device, for example in the case where the foot of the user accidentally slips on the accelerator pedal.

In contradistinction to known devices, the device according to the invention affords perfect safety in all possible failures or breakdowns owing essentially to the use of the two concentric elements **24, 26**, of which one is connected to the throttle member and the other to the control element **4**, these two elements being normally integral with each other but released when some defective operation occurs and each one being provided with a separate resiliently yieldable return means or spring for returning it to the idling speed position.

The presence of this second return spring guarantees safe operation in the event of breakage of the main return spring. Complete safety is also ensured in the event of seizure of the sleeve in its bearings owing to the fact that as the spindle and the sleeve are normally stationary with respect to each other, their facing surfaces undergo no wear. It is merely necessary to verify periodically that this rotation occurs freely, for example on the occasion of engine inspection every five or ten thousand kilometres.

It will be observed that the whole of the device, and in particular the coupling, is housed within the sleeve **34** integral with the control sector **4** and is thus perfectly protected.

FIGS. 4 and 5 show a slightly more complex embodiment which however includes the main features of the device shown in FIG. 2. The corresponding elements are designated in FIGS. 4 and 5 by the same reference numbers and merely the modifications or additions will be mentioned. The carburetor is also a duplex or twin carburetor having two bodies and FIG. 5 shows the ends 70, 71 of the links actuating the acceleration pumps (not shown) of the two carburetors and the known means for ensuring, at the end of the opening travel of the throttle member, an additional travel of the actuating mechanism should the vehicle be equipped with an automatic gearbox and the accelerator pedal must be capable of effecting, beyond its position corresponding to maximum opening of the throttle members, an additional travel corresponding to a kick-down ensuring in the automatic gearbox the change from a given speed ratio to an immediately lower speed ratio. This is achieved owing to the provision of a device having a lost motion which will not be described in detail and also to the provision, in association with the second body 21 of the carburetor, of two additional springs designated by reference numbers 73 and 74. The rest of the structure and the operation of this embodiment are in every way similar to those of the previously-described embodiment.

Having described my invention what I claim as new and desire to secure by Letters Patent is:

1. A device for controlling the feeding of fuel to an internal combustion engine, comprising a body defining a passageway, a fuel feed flow regulating means movable between a first position for opening the passageway and a second position for substantially closing the passageway, a control element for actuation by the user, connecting means operatively connecting the control element to the regulating means, the connecting means comprising a first member carrying the regulating means, a second member integral with the control element, bearing means within said body, the second member having a tubular portion rotatably mounted in said bearing means and extending transversely through said passageway the first member having a generally cylindrical shape and being rotatably mounted in said second member, aperture means being defined by the cylindrical portion of the second member for allowing passage of the regulating means therethrough, a releasable coupling interposed between the first member and the second member for normally engaging the second member with the first member to drive the first member, electromagnetic means for releasing the coupling, first resiliently yieldable return means associated with the first member, and second resiliently yieldable return means associated with the second member, the first and second resiliently yieldable means being independently operative to bias their respective associated members in a direction to normally bring the regulating means to said second position.

2. A device as claimed in claim 1, wherein said first return means is provided between said first and second members, and said second return means is provided between said body and said second member.

3. A device for controlling a feeding of fuel to an internal combustion engine, comprising a carburetor body defining an induction passageway, a throttle member movable between a first position for opening the passageway and a second position for substantially closing the passageway a control element for actuation by the user, connecting means operatively connecting the control element to the throttle member, the connecting means comprising a spindle carrying the throttle member, a sleeve integral with the control element, said sleeve being rotatably mounted in bearing means provided into said carburetor body and defining aperture means, the spindle being coaxial with and rotatable within the sleeve and the throttle member extending through said aperture means of the sleeve, a releasable coupling interposed between the spindle and sleeve for normally engaging the sleeve with the spindle to drive the spindle, electromagnetic means for releasing the coupling, first resiliently yieldable return means associated with the spindle, and second resiliently yieldable return means associated with the sleeve, the first and second resiliently yieldable return means being independently operative to respectively bias the throttle member and the control element in a direction to normally bring the throttle member to said second position.

4. A device as claimed in claim 3, wherein said first return means is a torsion spring, provided between said spindle and said sleeve, said second return means being a torsion spring provided between the body and said sleeve.

5. A device as claimed in claim 3, wherein the coupling comprises an intermediate member mounted on the spindle to rotate with but to slide axially on the spindle, a clutch device having first teeth associated with the intermediate member and second teeth which are associated with the sleeve and are drivingly engageable with the first teeth, third resiliently yieldable means for biasing the first and second teeth into engagement, the electromagnetic means being associated with the intermediate member to shift the first and second teeth out of engagement.

6. A device as claimed in claim 5, comprising an annular portion integral with the sleeve and the control element and enclosing the clutch device and the electromagnet, the third resiliently yieldable means being interposed between and engaging the intermediate member and the electromagnetic means which electromagnetic means is integral with the spindle.

7. A device as claimed in claim 1, comprising first adjustable abutment means associated with the first member and second adjustable abutment means associated with the second member for respectively determining the idling speed positions of the first and second members.

8. A device for controlling the feeding of fuel to an internal combustion engine comprising a duplex or twin carburetor having a first body defining a first induction passageway and a second body defining a second induction passageway, and, in association with each carburetor body and passageway: a throttle member movable between a first position for opening the associated passageway and a second position for substantially closing the associated passageway, a control element for actuation by the user, connecting means operatively connecting the control element to the throttle member, the connecting means comprising a spindle carrying the throttle member, a sleeve integral with the control element, the spindle being coaxial with and rotatable within the sleeve and the sleeve being mounted to rotate relative to the associated body, a releasable coupling interposed between the spindle and sleeve for normally engaging the sleeve with the spindle

to drive the spindle, electromagnetic means for releasing the coupling, first resiliently yieldable return means associated with the spindle and second resiliently yieldable return means associated with the sleeve, the first and second resiliently yieldable means being independently operative to respectively bias the throttle member and the control element in a direction to normally bring the throttle member to said second position, second connecting means operatively connecting the spindle which is associated with the first carburetor body to the spindle which is associated with the second carburetor body and third connecting means operatively connecting the sleeve which is associated with the first carburetor body to the sleeve which is associated with the second carburetor body.

9. A device as claimed in claim **8**, wherein said first return means is a torsion spring. provided between said spindle and said sleeve, said second return means being a torsion spring provided between the body and said sleeve.

10. A device as claimed in claim **8**, comprising, for each carburetor body, first adjustable abutment means associated with the corresponding spindle and second adjustable abutment means associated with the corresponding sleeve for respectively determining the idling speed positions of the corresponding spindle and sleeve.

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