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71 Applicant: **The Saunders J & F Carburettor Co. Limited, 18 Station Road, Watford, Hertfordshire (GB)**

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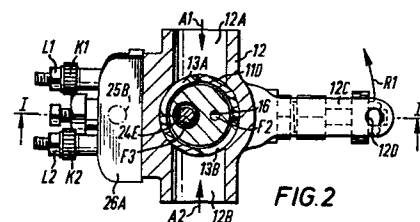
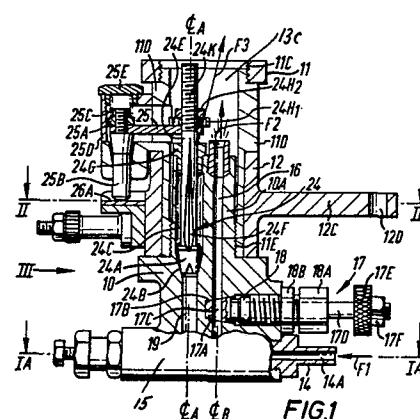
72 Inventor: **Saunders, Albert, 12 Victoria Avenue, Peacehaven, Sussex (GB)**

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74 Representative: **Daley, Michael John et al, F.J. CLEVELAND & COMPANY 40/43 Chancery Lane, London, WC2 1JQ (GB)**

54 **An improved carburettor.**

57 A floatless carburettor comprising in combination a fuel inlet (F1), two separate fuel outlets (F2, F3) to an air passage (13C) adapted to admit air from the atmosphere (A1, A2) and discharge it to an engine, a throttle control means (12C) by which the area of said air passage is progressively opened and closed (13A, 13B) to vary said area and an adjustable self-regulating pressure means (15) via which fuel is fed from the said fuel inlet (F1) to the carburettor.



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An Improved Carburettor

This invention relates to an improved carburettor.

It is well known that a spark ignition engine requires a practically homogeneous mixture of fuel and air to the cylinder of the engine with the relative proportion of each by weight controlled to within narrow limits. The theoretically correct ratio of air to petrol is about 15 : 1 but it is not possible to obtain a completely homogeneous mixture at this ratio under all engine conditions. Hence the engine will give maximum power on rich mixtures of air to petrol of about 10 to 1 to about 13 to 1 and economic running on lean mixtures of air to petrol of 14 to 1 to 16 to 1 for complete burning of the fuel. Under difficult engine starting conditions the air/fuel ratio may be unity owing to the poor evaporation of the fuel.

These requirements are not generally by a suction carburettor mounted at the entrance to the engine inlet manifold simultaneously to

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control the admission of air and fuel. A simple suction carburettor essentially comprises a venturi and one or more fuel jets fed from a float chamber. A butterfly throttle valve is
5 generally used to control the amount of the mixture that passes into the engine from the induction system. As air is drawn through the venturi and past the metering jet, its velocity increases and the pressure at the venturi is
10 reduced in proportion to the air flow. Meanwhile the pressure acting on the fuel bowl is substantially atmospheric, so that the resultant pressure differences forces the fuel through the metering jet into the air stream where it is atomized by
15 the high velocity air. Once the venturi and fuel jet sizes have been selected, the amount of fuel drawn from the jet depends on the pressure drop produced by the venturi.

Since the fuel metered depends on the
20 pressure drop of the air passing through the venturi the air-fuel ratio with a suction/float carburettor is self-compensating for atmospheric air pressure

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and temperature to some extent. The simple suction/float carburettor has been provided with supplementary devices to attempt to give the correct air/fuel ratios under various operating conditions in an engine but without success; thus the suction/float carburettor used inter alia in automobiles and motor cycles has a number of disadvantages. It remains an unsatisfactory fuel/air control device since the volume of the fuel and the air is not correlated for slow, intermediate and fast running conditions of an engine to which it is fitted. Consequently, fuel is generally used uneconomically in the said engine, which with present fuel shortages and high prices is not only a serious misuse of fuel but one that causes serious atmospheric pollution.

We have found surprisingly that a carburettor can be produced to overcome or at least to reduce the above noted difficulties.

According to the present invention we provide a floatless carburettor comprising in combination a fuel inlet, two separate fuel outlets to an air passage adapted to admit air from the

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atmosphere and discharge it to an engine, a
throttle control means by which the area of said
air passage is progressively opened and closed to
vary said area and an adjustable self-regulating
5 pressure means via which fuel is fed from the said
fuel inlet to the carburettor.

The invention will be more fully
understood from the following description of one
floatless carburettor given by way of example only
10 in relation to the Figures of the accompanying
drawings in which:-

Figure 1 is a sectional elevation on the
section station I I of Figure 2.

Figure 1A is a sectional view of a self
15 regulating fuel inlet pressure means to a larger
scale than that of Figure 1 on the section station
I_A, I_A of Figure 1.

Figure 2 is a sectional plan on the
section station II II of Figures 1 and 3.

20 Figure 3 is a side elevation in the
direction of arrow III of Figure 1, and

Figure 4 is a detail to a larger scale of
the operational character of the cam and its
associated parts referred to by arrow IV of Figure 3.

25 In the Figures of the drawings a floatless
carburettor is seen to comprise a body 10

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having an integral extension 10A screwed at 11E to a flange body 11D having a flange 11 provided with bolt fixing holes 11A, 11B (Figure 3) and screwed to the body at 11C.

5 Engine manifold air enters as shown by arrows A1.A2 (Figure 2) via ports 12A, 12B. in an accelerator sleeve 12 that is provided with throttle control means in the form of an integral lever arm 12C having at its extremity a bolt
10 fixing hole 12D. The manifold air passes via the ports 12A, 12B respectively to opening 13A, 13B in flange body 11D and discharges to an engine via passageway 13C making a right angle turn in so doing. Clearly rotation of accelerator sleeve
15 12 about flange body 11D progressively opens and closes the openings 13A, 13B.

In Figure 2 the flange body 11D is closely cross hatched diagonally specially to show the openings 13A, 13B which are not fully
20 open in the position shown in said Figure.

The body 10 contains a number of fuel passageways. Fuel enters the carburettor

(arrow F1) via pipe 14 from the fuel pump P along a passageway 14A to a self-regulating pressure means shown generally at 15 (Figure 1A) that comprises a ball 15A that seats on a seat 15B in a screwed union 5 15C and is forced against the fuel flow, shown by arrow F1, by a helical compression spring 15D acting on a compensatory cup 15E having a spigot 15G. A spring cap 15H together with compensatory cup 15E accept the opposed ends of helical spring 15D.

10 Spring cap 15H has a recess 15K for a screw 15L having a head 15L₁ which is a main adjustment head for valve 15. Screw 15L passes through a complex fuel gland comprising a plastics washer 15M a plastics packing 15N which packing is adjustable to

15 prevent fuel leakage by virtue of co-acting parts 15p1, 15p2, 15p3. It is to be noted that the compensatory cup 15E operates by the back pressure of the fuel and extends across centre lines ϕ_A , ϕ_B of Figure 1 which centre lines define the centres

20 lines define the centres of fuel outlets F2 and F3 of Figure 1. F2 is the idler outlet and F3 is the outlet for normal running. A fuel passageway 16 normal to passageway 14A is adjustable by virtue of a valve shown generally at 17 that comprises

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essentially a frusto-conical valve end 17A and seat 17B; the said end 17A having therein a hole 17C that extends in line with passageway 16. The frusto-conical valve end 17A has an extension 5 17D provided with a knurled end 17E and locknut 17F. The said end 17A is able to be forced against its seat 17B by a screwed member 18 having an hexagonal end 18A and locknut 18B. A further fuel passageway 19 normal to 14A is provided with a valve shown 10 generally at 24. Valve 24 comprises a frusto-conical valve 24A in a frusto-conical valve seat 24B. A helical compression spring 24C co-operates with valve 24B that has a complex form since its stem 24E contains parallel to its axis ϕ_A a tapered 15 groove 24F providing a V throat progressively increasable in area upon opening and progressively decreasable in area upon closing; the groove is at its most wide toward the lower part 1 and at its most narrow toward the upper part as shown in 20 Figure 1. A hexagonal headed screwed member 24G retains the spring 24C and has an orifice that receives the said stem 24E. An important refinement in the operation of valve 24 is provided by

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means of a mechanical linkage that by its disposition inter se is able to give a substantially homogeneous mixture of fuel and air under various engine running conditions. The linkage comprises

5 a lifter arm 25 co-operating with a serrated nut 24H₁ and locknut 24H₂ screwed onto a screw threaded part 24K of stem 24E. Lifter arm 25 is fixed at 25A to a rod 25B spring urged via helical compression spring 25C in guide box 25D that

10 is integral with flange body 11L. The box 25D has a screw cap spring seat 25E. The rod 25B rests upon flat face 26A of a cam 26 that is adjustable in its inclination to axis ϕ_A (Figure 3) as shown by line Y1Y2 in the plane of the flat

15 face 26A of cam 26. The flat face 26A may for convenience be set, in respect of end point 25F (Figure 3) of rod 25B, to be at an angle α to a line Z25F normal to line Y1Y2. The adjustability and the setting of angle α of cam 26A is effected

20 by two co-operating eccentrics 27A, 27B, these are shown most clearly in Figure 4. The diameter d_1 of eccentric 27A is greater than the diameter d_2

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of eccentric 27B. The eccentrics co-operate about their respective pivot points $27A_p$ $27B_p$ with curved recesses 28A, 28B in the underside of cam 26. The cam 26 has a pair of slots 26B, 26C and these are loosely fitted over bolts B1, B2 (Figure 3) that are co-incident with centres $27A_p$ $27B_p$. Each eccentric 27A, 27B has an extension having a knurled end K1 K2 that may be locked in position on its respective bolt B1 B2 by a locknut L1 L2. Clearly such a linkage offers a multiplicity of accurate settings commensurate with the air/fuel mixtures at different running conditions of the engine.

The modus operandi of the floatless carburettor shown in Figures 1, 1A, 2, 3 and 4 is as follows :-

First we identify passageway 16 centre line ϕ_B with fuel outlet at F2 as the idling or slow running fuel outlet, and passageway 19 centre line ϕ_A with fuel outlet at F3 as the intermediate and fast running fuel outlet or the normal running outlet.

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Passageway 16 is adjustable by valve 17.

Passageway 19 is adjustable by valve 24. Fuel
self regulating pressure
inlet to the carburettor is adjustable via/valve

15. Consider now that the carburettor in use
5 is fitted to a particular engine then the fuel
supply is first adjusted to the requisite
pressure p from fuel pump P (not shown). Fuel
passes to fuel passageway 16 and the idling or
slow running requirement of the engine are adjusted
10 by valve 17 and fuel issues from the outlet at
 F_2 , which outlet may be fan shaped if necessary.

Fuel also passes to fuel passageway 19
and the intermediate and fast running requirements
of the engine are adjusted by the arm 12C attached
15 to the accelerator which actuates openings 13A, 13B
in relation to air ports 12A, 12B and actuates
rod 25B in co-operation with surface 26A to vary
the position of tapered V groove 24F which by its
vertical position in passageway 19 control the
20 V throat opening at fuel outlet F_3 which is most
clearly shown at F_3 in Figure 2.

When now the operator requires the engine
to develop more power the accelerator lever arm 12C

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is moved in rotation (arrow R1) about flange body 11D and ports 12A, 12B come more into alignment with openings 13A, 13B giving a greater flow of air to the engine manifold.

5 At the same time valve 24 from its setting on spring 24C demands fuel and this is supplied via the variable V throat at F3, which for any given engine is defined by:-

- a the inclination α of cam face 26A
- 10 b the depth and width of the tapering V groove 24F in stem 24E.
- c the position to which the V groove throat is lifted linearly in the cylindrical bore of circular cross
- 15 section in member 24G.

Clearly as the accelerator lever 12C is rotated in direction of arrow R₁ (Figure 2) not only do the air ports 13A, 13B open but the inclination α of cam 26 progressively lifts the rod 25B and progressively lifts stem 24B and increases the

20 area of the throat of F3 (Figure 2) with the increased demands on the engine. Thus fuel at F3 is progressively increased in volume with the

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volume of air which volumes are accurately correlated by the setting of cam 26 about eccentrics 27A, 27B.

If the carburettor is now fitted to
 5 another engine making different demands upon it then the valves 15, 17 and 24 are re-adjusted, the angle α reset to β_1 for the requirements put upon the fast running valve 24. No longer is the fuel metered dependent, as in the orthodox
 10 suction float carburettor on the pressure drop generated by the air passing through a venturi, in contra-distinction it is accurately adjusted to the fuel pump delivery for slow intermediate and fast running conditions with air and fuel
 15 volumes correlated to the practical or theoretically correct mixture of air and fuel essential to the engine power.

self regulating

We have finally to deal with the valve shown generally at 15. It is set for a fuel
 20 pressure p to the carburettor from the fuel pump P. If now the preset pressure p rises inside the carburettor for any reason to a pressure p_1 then the excess ^{or back} pressure ($p_1 - p$) acts on compensatory

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cup 15E and produces a force (arrow F4 Figure 1A) in opposition to the force of the fuel flow shown by arrow F1 (Figure 1A). This force F4 seeks to close the valve 15 at 15A, 15B and restore the pressure in the carburettor to the preset pressure P.

To prevent leakage of fuel at screwed connections in the carburettor, double screwed glands may be employed.

The path of the fuel jets to the air discharged to the engine is of interest. Both jets F2, F3 project the fuel substantially parallel to the air at discharge via the passageway.

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CLAIMS:

1. A floatless carburettor comprising in combination a fuel inlet, two separate fuel outlets to an air passage adapted to admit air from the atmosphere and discharge it to an engine, a throttle control means by which the area of said air passage is progressively opened and closed to vary said area and an adjustable self-regulating pressure means via which fuel is fed from the said fuel inlet to the carburettor.

2. The floatless carburettor according to claim 1 wherein the adjustable self-regulating pressure means includes an adjustable ball valve.

3. The floatless carburettor according to claim 1 or claim 2 wherein the self-regulating pressure means includes a compensatory cup actuated by back pressure from the fuel.

4. The floatless carburettor according to claim 3 wherein the compensatory cup extends across the centre lines of the two fuel outlets.

5. The floatless carburettor according to any preceding claim wherein each of said fuel outlets is adjustable by a valve one fuel outlet being an idling outlet and the other having a throat variable in area that is progressively increased and decreased as the opening of said air passage is progressively increased and decreased in area, said throat and said air passage opening both co-operating with said throttle control means that directly opens and closes said opening of said air passage and via an adjustable cam gives a linear movement of the throat to provide an air/fuel relationship at said discharge that is adjustably predeterminable by said cam for any given engine to which the carburettor is fitted and which air/fuel relationship once predetermined is varied automatically with the opening and closing of said throttle control means via said cam.

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6. The floatless carburettor according to claim 5 wherein the throat is a V-shaped throat defined by a tapering V groove in a valve spindle that is slideable in a cylindrical bore of circular cross-section.

7. The floatless carburettor according to claim 6 wherein the fuel from the V throat is projected substantially parallel to the air flow in the air passage at its discharge.

8. The floatless carburettor according to any one of claims 5 to 7 wherein the cam has a flat surface that is adjustable to allow the inclination of said flat surface to be varied to the line of action of a cam follower that slides the V groove in its bore.

9. A floatless carburettor according to claim 8 wherein the fuel from the V throat is dependent upon the inclination (α) of the cam, the depth and width of the V groove and the said linear movement of the throat in its bore which movement is controlled by said inclination.

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10. The floatless carburettor according
to claim 9 wherein the inclination of the cam is
adjustable by means of at least one eccentric.



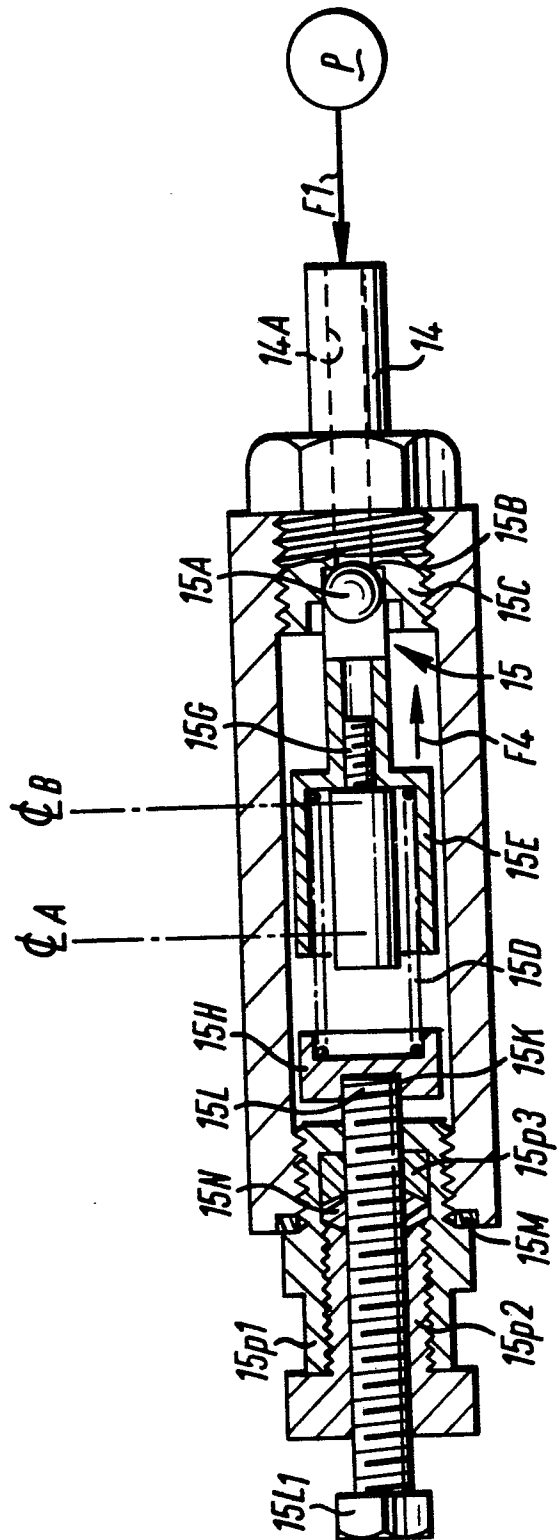
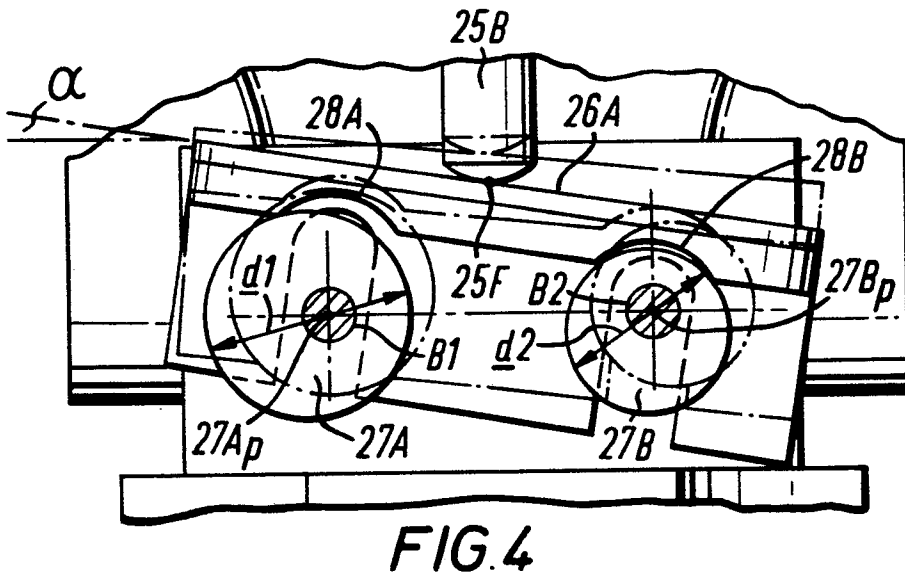
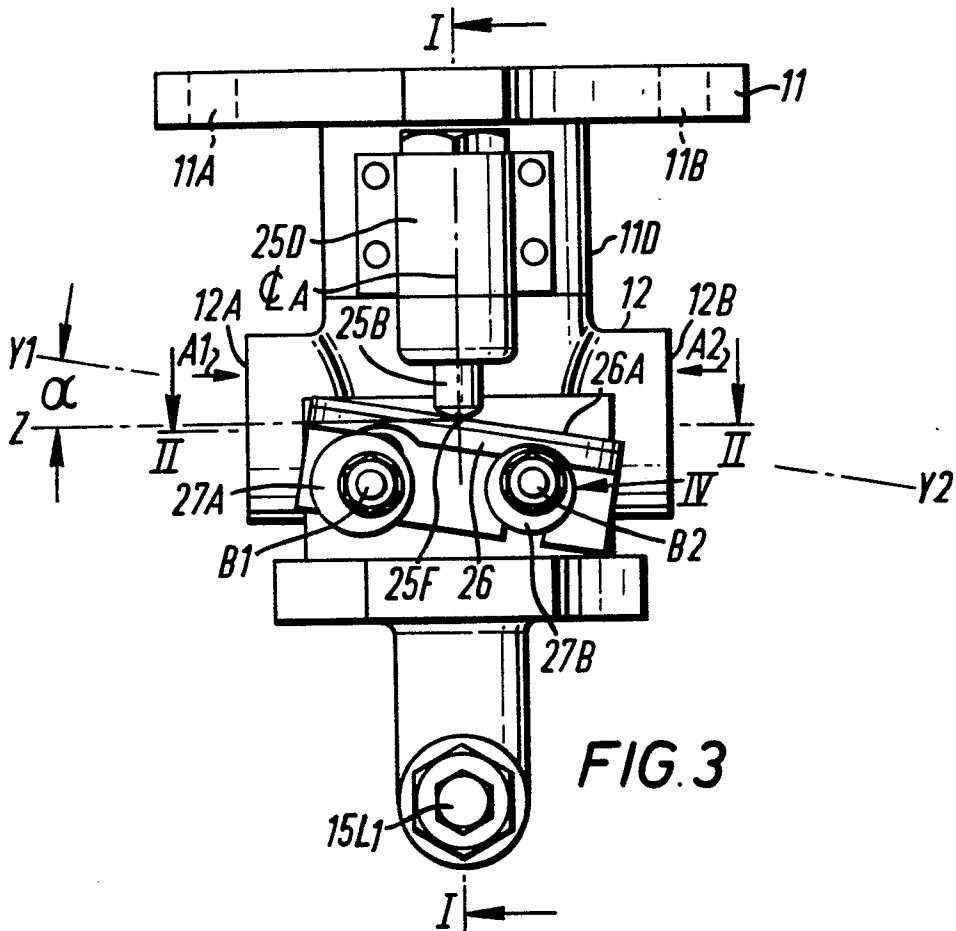


FIG. 1A





European Patent
Office

EUROPEAN SEARCH REPORT

0009318

Application number

EP 79 301 645.2

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl.)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
X	<u>US - A - 3 331 360</u> (R.L. FLEMING) * columns 1 to 4; fig. 2, positions 14, 16, 18, 35, 109 * --	1,5, 8-10	F 02 M 17/04
	<u>FR - A - 1 042 918</u> (R. POMIÈS) * page 1, column 2, fig. * --	2-4	
A	<u>DE - C - 496 591</u> (R. RICHTER) * whole document * --		TECHNICAL FIELDS SEARCHED (Int. Cl.)
A	<u>US - A - 3 640 512</u> (H. MORGENROTH) * whole document * --		F 02 M 17/00 F 02 M 69/00
A	<u>US - A - 3 161 700</u> (T.M. BALL) * whole document * --		
A	<u>US - A - 3 102 152</u> (E.R. SCHNEIDER) * whole document * --		
A	<u>US - A - 2 783 033</u> (E.E. HALIK) * whole document * ----		CATEGORY OF CITED DOCUMENTS
<input checked="" type="checkbox"/> The present search report has been drawn up for all claims			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
Place of search Berlin		Date of completion of the search 20-12-1979	Examiner STÖCKLE