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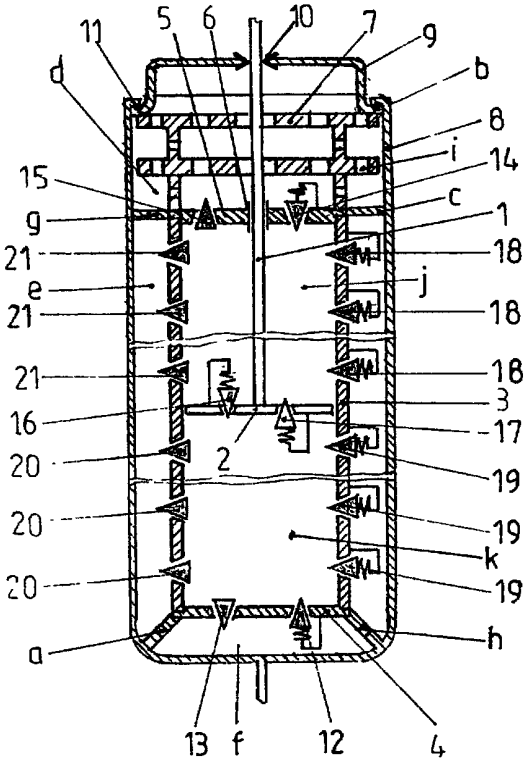

(57) Abstract: The invention deals with an automative self-adjustable damper having a progressive damping characteristic meant to be used with vehicles and motor vehicles for damping the swing of the wheels, chassis, carosserie, the drivers and passengers seats, the engine set as well as in parachoke bars for impact energy absorbtion. Depending on the situation it can be used unpressurized, at a low pressure for improving the damping characteristic or pressurized at a high pressure for assuring a buoyant force too. For damping the oscillations it is recommendable to use high damping coefficients which have the disadvantage of reducing the comfort. The active and semiactive suspensions assure the variation of the damping coefficients function of the needs but they are complicated to build, they are expensive and require high power consumptions. According to the invention the shock absorber has the advantage of assuring a large range of damping coefficients function of the relative piston position in the cylinder as well as a technological simplicity. Both on rebound and compression, the damping coefficients have low values at the beginning of the strokes becoming medium at the middle of the stroke and high and very high when getting to the end of it. Thus a good adherency wheel-road, comfort and protection at the end of the stroke are assured. This shock absorber is made up of several systems: energy dissipation system, rod volume compensation system, the guiding scaling system and the resistance part protecting all these systems.

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THE AUTOMOTIVE SELF - ADJUSTABLE DAMPER WITH A DISSIPATIVE SELF - CORRECTING CHARACTERISTIC

The invention deals with an automotive self-adjustable damper having a progressive damping characteristic meant to be used with vehicles and motor vehicles for damping the swing of the wheels, chassis, carosserie, the drivers and pasengers seats, the engine set as well as in parachoke bars for impact energy absorbtion. Depending on the situation it can be used unpressurized, at a low pressure for improving the damping characteristic or pressurized at a high pressure for assuring a buoyant force too.

At high pressures it can be used as a stabilizer for the bonnets and dors both for vehicles and motor vehicles and for civil and industrial constructions, furniture and different household articles.

For damping the oscillations it is recommendable to use high damping coefficients which have the disadvantage of reducing the confort. The active and semiactive suspensions assure the variation of the damping coefficients function of the needs but they are complicated to build, they are expensive and require high power consumptions.

One knows a relatively simple solution of the Monroe company called Sensa - Trac, assuring small damping coefficients in the medium working area of the piston and so, comfort and normal resting coefficients. The solution is applied to the classical hydraulic shock-absorber and consists to of a cupping of the inner cylinder in the medyum area which increases the hidraulic loss and these decreasing damping coefficients both for the rebound stroke and for the compression one.

The disadvantages of the solution are due to the technological complication when cupping the cylinder as well as due to the fact that the damping coefficient variation is low not assuring the protection at the end of the stroke.

According to the invention the shock absorber has the advantage of assuring a large range of damping coefficients function of the relative piston position in the cylinder as well as a technological simplicity. Both on rebound and compression , the damping coefficients have low values at the beginning of the strokes becoming medium at the middle of the stroke and high and very high when getting to the end of it. Thus a good adherency wheel-road, confort and protection at the end of the stroke are assured.

This shock absorber is made up of several systems: energy dissipation system, rod volume compensation system, the guiding sealing system and the resistance part protecting all these systems. The most principal one is the energy dissipation system consisting of a cylinder, closed at ends with blocks containing or no filling valves or mixed ones filling and checking , having sideways checking valves and eventually filling valves, placed optimum between the two ends. A piston with or without

checking valves but without filling valves runs inside the cilynder. Due to this structure the moving of the piston is easier at the beginning of the stroke because the discarge of the working fluid is on several valves. As the piston approaches the end of the stroke the number of the valves implied decreasses, the resistance increasing accordingly. The situation is similar for both strokes: compression and rebound.

The compensation of the volume of the rod carrying out the stroke can be made through compensating rooms placed above the valves or below them, with a pressurized bladder and with external compensating rooms, at atmospheric pressure or pressurized.

According to the invention the shock absorber has the following advantages:

- at the beginning of the stroke it assures low damping coefficients allowing the system to reach quickly the medium working area permitting thus a good confort;
- it assures medium damping coefficients in the medium working area that is an optimum compromise between adherency and comfort;
- after the medium area it provides increased damping coefficients for a good damping of the carosserie oscillations and assuring a good adherency;
- to the end of the stroke it provides high damping coeffficients eliminating the cushoning at the end of stroke protecting thus the carosserie, mechanic, improving the passanger comfort and eliminating the noise specific to this regime;
- with the simple versions the piston does not have valves and the valves located on the inner cylinder are reduced to calibrated holes/ slots providing thus a constructive simplicity, robustness and a low price;
- by applying the version with piston with membranes or little pistons the comfort and adherency at small dislevelment are increased and improve the damping along the others sections which, under these circumstances can be tared for stronger adjustments;
- the replacement of the inner cylinder with valves with a porous cylinder with controlled capillarity assures a solution of a great simplicity, robustness, fiability and low price;
- it is better used to achieve semiactive suspensions having practically infinite checking possibilities;
- it allows achieving the shock- absorbers for parashock bumper, reinforced and adjusted according to the new destination;
- pressurized and tared accordingly it can be used as door balancer, damper for 5th door of break , shock absorber for revolving doors on vertical axes, for the suspension of the engines or of the driver and passenger seats;
- the lamination of the working fluid through several valves increases the fiability , reduces the noise level and assures a low thermal regime;

We give 27 examples of achieving the invention referring to figures 1...30 representing:

figure 1: the general design of principle containing the proposed solution, according to the first accomplishing example;

figure 2: the design for the version with checking valves located only in the inner cylinder according to the second accomplishing example;

figure 3: the design for the version with two rod guidings, according to the third accomplishing example;

figure 4: the design of principle for the version with the rod guiding and sealing located in the superior block according to the fourth accomplishing example;

figure 5: the design for the version with the piston located to the centre of the rod, according to the fifth accomplishing example;

figure 6: the design for the version with the valves filled through siphoning, according to the sixth accomplishing example;

figure 7: the design for the version with lateral pressurized compensation, according to the seventh accomplishing example;

figure 8: the design for the version with external compensation, for working in any position, according to the eighth accomplishing example;

figure 9: the design for the version with lateral compensation, for working in semihorizontal position, according to the ninth accomplishing example;

figure 10: longitudinal section for the version with compensation through the pressurized bladder, according to the tenth accomplishing example;

figure 11: cross section for the version with compensation through the pressurized bladder, according to the tenth accomplishing example;

figure 12: the design for the version with compensation through exterior pleated tube , according to the eleventh accomplishing example;

figure13: the design for the version with compensation through compensation chamber placed in the lower part of the tank cylinder, with the liquid separated from the gas through a floating piston-version1,according to the twelfth accomplishing example;

figure 14: the design for the version with compensation through compensation chamber placed in the lower part of the tank cylinder with the liquid separated from the gas through a floating piston - version 2, according to the thirteenth accomplishing example;

figure 15: the design for the version with compensation through the compensation chamber located in the lower part of the tank cylinder with the liquid separated from the gas through floating piston - version 3, according to the fourteenth accomplishing example;

figure 16: the design for the simple version using slots as controlling valves, according to the fifteenth accomplishing example;

figure 17: the design for the version with a poros inner cylinder, according to the sixteenth accomplishing example;

figure 18: the design for piston with membrane, according to the seventeenth accomplishing example;

figure 19: the design for piston with two membranes, according to the eighteenth accomplishing example;

figure 20: the design for piston with opposite little pistons, according to the nineteenth accomplishing example;

figure 21: the design for the piston with little piston in little piston, according to the twentieth accomplishing example;

figure 22: the design for the version of thermal compensation with ring, according to the twenty-first accomplishing example;

figure 23: the design showing the evolution of the temperature clearance for the version of thermal compensation with ring, according to the twenty-first accomplishing example;

figure 24: the design for the version of thermal compensation with plunger, according to the twenty-second accomplishing example;

figure 25: the design for the version of thermal compensation with closer, according to the twenty-third accomplishing example;

figure 26: the design for total adjustment version, according to the twenty-fourth accomplishing example;

figure 27: the design for stepped adjustment version, according to the twenty-fifth accomplishing example;

figure 28: the design for continual adjustment, according to the twenty-sixth accomplishing example;

figure 29: the design for changing the adjustment with profiled ring, according to the twenty-seventh accomplishing example;

figure 30: damping diagram;

The automotive self-adjustable damper with a disipative self-correcting characteristic according to the first accomplishing example represents the principle design of the invention. A rod (1) drives off a piston (2) in an inner cylinder (3), closed at its inferior end by an inferior block (4) and at its superior end by a superior block (5) containing the rod guiding (6) too. In order to maintain the running liquid above the valves in a dinamic regime, a labyrinth system (7) is atached on superior part. All these elements are introduced in an outer cylinder (8) closed with a lid (9), the rod (1) passes through, sealed by a sealing element (10). The lid (9) is sealed as to the outer cylinder (8) through a sealing fitting (11). The fixing of the assembly made up by the inner cylinder (3), the lid (9), the inferior (4) and superior (5) blocks and labyrinth (7) is done axially between a proeminence (a) and a cupping (b) of the outer cylinder (8), and the lateral centring is assured by the same proeminence (a) and by a collar (c) of the superior block (5). The inferior block (4) contains an adjustment compression valve (12) and a filling rebound (13) one .

The superior block (5) contains a checking rebound valve (14) and a filling compression valve (15). The piston (2) may contain or not a checking compression valve (16) and/or checking rebound valve (17). The inner cylinder (3) contains checking rebound valves (18) and checking compression valves (19) and may contain or not filling rebound valves (20) and filling compression valves (21) placed conveniently as position and number. The checking valves placed on the inner cylinder above the piston always work at the rebound stroke, and the check valves placed under the piston work on compression stroke, so that function of the position and the sense of the piston stroke, the same valve may have a check role on rebound or compression , that is one or several valves (18) may become (19) and the other way round. In the same way, the filling valves placed on the inner cylinder become active on rebound or compression, function of position and the sense of the piston running, thus one or several valves (20) becoming (21) or the other way round. The volume of the rod is compensated through the compensating chamber (d), placed above the valves, the circulation of the liquid between this and enclosure (e) between inner cylinder (3) and outer cylinder (8) and (f) between lower part of the outer cylinder (8) and inferior block (4), being accomplished through some passing holes (g) placed in the superior block (5), in the inner nose (h) respectivelly, of the outer cylinder (8) and (i) in labyrinths (7).

During the compression stroke due to the superpressure built up under the piston (2), the filling rebound valves (20) in the inner cylinder (3) placed under the piston (2) and filling rebound valve (13) in the inferior block (4) close , the liquid having to pass through the checking compression valves (19) placed on the inner cylinder (3) under the piston (2) and when existing through the checking compression valve (12) in the inferior block (4) and (16) in piston (2). The more the piston approaches the inferior block (4) the more the number of the active checking compression valves (19) placed in the inner cylinder (3) is reduced and thus the damping force increases due to the increase of the speed of the liquid flowing through these valves. At the same time with the closing of the filling valves from under the piston (2), the filling compression valves (21) placed on the inner cylinder (3) above the piston (2) and/or the filling compression valve (15) in the superior block (5) open due to the pressure differences, assuring the filling with liquid of the working inside (j) above the piston preparing thus the rebound stroke. The dissipation characteristic function of the position of the piston changes as necessary by the corresponding placing and taring of the checking valves.

At the rebound stroke the overpressure built up above the piston (2) closes the filling compression valves (21) placed in the inner cylinder (3) and/or filling compression valve (15) placed in the superior block (5), forcing the liquid to pass through the checking rebound valves (18) in the inner (3) cylinder, placed above the piston (2) and if any through the checking rebound valve (14) in the superior block

(5) and (17) from piston (2). As the piston approaches the superior block (5), the number of the checking rebound valves (18) active decreases so that the damping force increases. The depression from under the piston (2) opens the filling rebound valves (20) from under the piston placed on the inner (3) cylinder and the filling rebound valve (13) in the inferior block (4), allowing the filling with liquid of the working area (k) on rebound stroke, preparing thus the compression stroke. Function of the location, the number and taring of the checking valves one obtains the required dissipation function as reported to the piston position.

The filling valves can vary in number function of the accomplished version being reduced to two pieces, one in the superior area (for preparing the rebound stroke) and one in the inferior area (for preparing the compression stroke), placed in the blocks or on the inner cylinder. These valves can be with plates, with segment or with ball. The checking (12) and (14) valves in the inferior block, superior respectively may be missing, so may the checking valves (16) and (17) in the piston. The number of the checking valves in the inner cylinder may be unlimited.

For the correct working of this version one must permanently assure a minimum level of liquid superior to the highest filling valve, thus the valves must be permanently flooded. The requirement is assured by the superior compensating chamber (d), edowed with the labyrints (7) system, for keeping the oil above the valves, in a dynamic regime.

For a better working one may produce a low pressurization, for an upward force high pressurization and in the case of using as a balancing unit a high pressurization.

The automotive self-adjustable damper with a dissipative self-correcting characteristic according to a second accomplishing example has its inner (22) cylinder equiped only with checking rebound valves (23) and checking compression valves (24) and eventually at ends with a filling compression valve (25) and a filling rebound valves (26). The superior block (27) can contain or not a filling compression valve (28). The inferior block (29) can contain or not a filling rebound valve (30). The filling of the inner cylinder to rebound stroke is achieved through one or both filling valves located in the inferior area (26) and/or (30), function of the solution adopted by the manufacturer. The filling of the inner cylinder to compression stroke is achieved through one or both fillig valves located in the superior area (25) and/or (28), function of the desired version. The piston may contain or not the checking valves (16) and (17). To allow the circulation of the oil, the superior block (27) has some holes (l).

The automotive self-adjustable damper with a dissipative self-correcting characteristic according to a third accomplishing example has the closing lid (31) of the outer cylinder equipped both with the sealing element (32) and with a guiding element (33) with a view of a better sealing and overtaking the lateral forces.

The automotive self-adjustable damper with a dissipative self-correcting characteristic according to a fourth accomplishing example has the superior block (34) equipped both with checking rebound valve (35), filling compression valve (36) , a guiding (37) and with the sealing element (38). To allow the circulation of the oil, the superior block (34) is endowed with some holes (m). The labyrinth system (39) is corresponding configurated and may be fixed on the superior block (34) or on the outer cylinder . The lid (40) for closing the outer cylinder is sealed as to the superior block through an oil sealing O- ring (41).

The automotive self-adjustable damper with a dissipative self-correcting characteristic according to a fifth accomplishing example has the rod (42) longer in the inferior part too, this being guided also in a guiding system (43) contained in the inferior block (44) and sealed lowerly through a sealing element (45), placed in the outer cylinder (199). The inferior block (44) may contain or not checking compression valve (46) and/or filling rebound valve (47). The version has the advantage of a superior guiding and at equal widths of the rod on either side of the piston, the compensation of the rod volume is not necessary. So the superior clothing lid (48) is specific, the compensation chamber (n) being smaller. The sealing of the rod is achived through a sealing element (49) placed on the lid (48).

The automotive self-adjustable damper with a dissipative self-correcting characteristic according to a sixth accomplishing example has its inner cylinder (50) with checking valves (51) and filling valves (52) in the superior area , lowered through some tubes (53), (54), (55) and respectively (56), (57), (58) under the level of the liquid, which is maintained in a dynamic regime in the inferior part through some allayers (59) fixed on the inner cylinder (50) or on the outer cylinder (60). The outer cylinder (60), the superior block (61) contains a guidance (64) too and the lid (62) contains a sealing element (65). The circulation of the liquid thrrough the outer (60) cylinder is done through some holes (o) in the superior block (61) and through some holes (p) in the allayers (59).

The automotive self-adjustable damper with a dissipative self-correcting characteristic according to a seventh accomplishing example assures the compensation of the volume of the rod through the liquid in the inside enclosure (q) of a lateral chamber (66), fixed on the closing lid (67) whose interior communicates through a hole (r). To compression the volume of the outgoing rod is compensated by the liquid enclosure (q) pushed due to the expansion of the inside gas (s). The lid (67) is equipped with an element (69) for the rod sliding sealing. The version allows the working in any position because the plated tub (68) does not allow the penetration of the gas into the working liquid. The gas pressurization may be low, medium, or high, function of the desired effect.

The automotive self-adjustable damper with a dissipative self-correcting characteristic according to a eighth accomplishing example has the compensation of

the rod volume assured by the liquid to be found enclosure (t) an exterior compensation chamber (70) which is connected to a clothing lid (71) through a flexible pipe (72) with which it communicates through a hole (u). The lid (71) assures the sliding sealing of the rod through a sealing element (73). Unlike the seventh example, with this example the compensation is achieved at the atmospheric pressure. In order to reduce the cavitation or assuring the upward force one may use the pressurized version, case in which the hole (v) is closed after the introduction of a compressed gas inside (t) in the exterior chamber (70).

The automotive self-adjustable damper with a dissipative self-correcting characteristic according to the ninth accomplishing axample assures the compensation of the rod volume through the liquid inside (w) of a lateral chamber (74), fixed on a lid (75) for closing the outer cylinder (8) it comunicates with through a hole (x). The sealing of the rod (1) is achieved through an element (76) on the closing lid (75). The compensation is done at the atmospheric pressure or presurized through a compressed gas introduced inside (w) chamber (74), situation imposing the closing of the hole (y) for communication with the atmosphere.

The automotive self-adjustable damper with a dissipative self-correcting characteristic according to the tenth accomplishing example assures the compensation of the rod volume with pressurized bladder (77)- U.S. Patent (December 24, 1985. 4.560.042) placed between the inner cylinder (3) and the outer cylinder (78). In its superior part the inner cylinder (3) is closed by a superior block (79) containing a guiding (80), endowed with some communication orifices (z), for allowing the working liquid cirrculation and which can have or not a checking rebound valve (81) and/or a filling compression valve (82). The assembly is closed by a lid (83) containing an element (84) for the sliding sealing of the rod (1) and which is sealed against the outer cylinder (78) through an element (85).

The automotive self-adjustable damper with a dissipative self-correcting characteristic according to the eleventh accomplishing example assures the compensation of the rod volume through the liquid contained in an enclosure (a') between an exterior pleated tube (86) and a cylinder (87) it is connected to through some constricted clamping rings (88). The communication between the enclosure (a') and the inside of the outer cylinder (87) is done through some holes (b'). The pressurization level is controlled through the rigidity of the pleated tube (86) and by using some springs (89) and/or the pressure of the gas in an enclosure (c') delimited by a protection housing (90), the pleated tube (86) and outer cylinder (87). When no pressurized gas is used the inside (c') communicates with the atmosphere through one or several holes (d') on the housing (90). The assembly is closed by a lid (91), equipped with a fitting (92) assuring the rod sealing.

The automotive self-adjustable damper with a dissipative self-correcting characteristic according to the twelfth accomplishing example assures the compensation of the rod volume with the help of the liquid contained in a room (e') formed between an inferior block (93), the inferior lateral side of an outer cylinder (94) and a floating piston (95) sliding on the specially processed surface (f') in the outer cylinder (94). The chamber (e') communicates with a lateral inside (g') formed between the inner cylinder (3) and the outer cylinder (94) through some holes (h') in the (i') nose of the inferior block (91) playing a centring and fixing part. The compensation is done due to the force created by the floating piston (95) as a result of the pressure of the gas contained in a separating chamber (j') formed between the lower part of the outer cylinder (94) and the floating piston (95). The outer cylinder (94) is endowed with a collar (k') for the inferior fixing of the inferior (93) block. The stroke of the floating piston (95) is limited upward by the some collar (k'), and downward by a stopper (96). The inferior block (93) may have or not a checking compression valve (97) and/or a filling rebound valve (98). The assembly is closed by a lid (99), endowed with a fitting (100) assuring the rod sealing.

The automotive self-adjustable damper with a dissipative self-correcting characteristic according to the thirteenth accomplishing example assures the compensation of the rod volume throught the liquid in a compensation chamber (l') formed between the inferior block (4), a solidary support (101) with an outer cylinder (102) and a floating piston (103), sliding inside the support (101), along a processed area (m'). Between the piston (103), the support (101)and the inferior part of the outer cylinder (102) there is an enclosure (n') containing pressurized gas. between the inner cylinder (3) and the outer cylinder (102) there is a chamber (o') communicating with the compensation (l') chamber through some holes (p') in the support (101). The compensation is done due to the pressure of the gas in the enclosure (n') which forces the passing of the liquid in the compensation (l') chamber through the floating piston (103) into the lateral (o') chamber. In order not to allow the obturation of the communicating (p') hole and the mixing of the gas with the working liquid the stroke of the floating piston (103) is limited through a superior stopper (104) and an inferior (105) one. The support (101) is endowed with an area (q'), for centring and fixing the inferior block (4). The chamber (n') containing pressurized gas can communicate with an equipment for controlling the pressure through a hole (r') which is normally closed. The assembly is closed with a lid (106), equipped with a fitting (107) assuring the rod sealing.

The automotive self-adjustable damper with a dissipative self-correcting characteristic according to the fourteenth accomplishing example assures the compensation of the rod volume through the liquid in a chamber (s'), in the lower part of an outer cylinder (108) and formed between this, the solidary support

(109) in the lower part of the outer cylinder (108) and the floating piston (110) sliding in the support (109) in an area (t') processed with this view. The support (109) has in its central part a chamber (u') containing a compressed gas acting on the piston (110) and in its superior part it has a processed area (v') for assuring the fixing and centring of the lower block (4). Between the inferior block (4) and the support (109) there is a chamber (w') communicating with the enclosure (x'), formed between the inner cylinder (3) and the outer cylinder (108) through some holes (y'). The chamber (x') communicates with chamber (s') through some holes (z'). The compensation is achieved due to the pressing of the pressurized gas in chamber (u') on the piston (110) which in its turn acts on the liquid in chamber (s'). The stroke of the floating piston (110) is limited by a superior stopper (111) and an inferior one (112) for not allowing the mixing of the gas with the liquid. The assembly is closed with a lid (113), equipped with a fitting (114) assuring the rod sealing.

The automotive self-adjustable damper with a dissipative self-correcting characteristic according to the fifteenth accomplishing example has a superior block (115) and inferior block (116) and an inner cylinder (117) with check valveses made up of some calibrated (a''), (b''), (c''), (d'') and (e'') holes/ slots respectively, the number of holes/slots (b''), (c''), (d'') being unlimited. These holes/slots can be placed both in the inner cylinder (117) and in one or both superior (115) and/or inferior (116) blocks. The filling of the inner cylinder (117) is done through some filling (118)/ (119) valves located in the superior/ inferior area of the cylinder (117) and/or through a valve (120) placed in the superior block (115) and/or valve (121) placed in the inferior block (116). Two filling valves are enough, one for the superior part and one for inferior one , when function of solution they can be placed in the inner cylinder (117) or in the superior (115) or inferior (116) block. The drawing of the liquid is done by a piston (122) nonequipped with valves.

The automotive self-adjustable damper with a dissipative self-correcting characteristic according to the sixteenth accomplishing example has an inner cylinder (123) made from a poros material with a controlled capilarity representing thus a simple and cheap solution. The filling is assured by a filling valve (124) placed in a superior block (125) and one (126) placed in an inferior block (127). The liquid is drawn by a piston (128) nonequipped with valves.

The automotive self-adjustable damper with a dissipative self-correcting characteristic according to the seventeenth accomplishing example has a working piston (129) endowed with internal membrane (130) separating the inside of the piston (129) in two enclosures (f''), (g'') comunicating with the interior of the inner cylinder through some holes (h''), (i'') in the superior/ inferior side of the piston

(129). The membrane (130) changes its form due to the pressure differences on the two sides of the liquid coming from the working cylinder assuring the damping characteristic uniformization. The membrane may be strengthened or not with some springs (131) and (132). The hydraulic shock damping degree is controlled through the membrane (130) rigidity and of the springs (131), (132) as well as through the holes (h''), (i'') dimensions . The membrane stroke is limited by some bumpers (133), (134) placed on the interior sides of the piston (129). In order to reduce the hydraulic loss the piston may be equipped with a segment (134) made from an organic, metalic, or metal-ceramic material.

The automotive self-adjustable damper with a dissipative self-correcting characteristic according to the eighteenth accomplishing example has a working piston (136) endowed inside with two elastic membranes (137), (138) on either side of a diaphragm (139) placed half way the distance of the piston (136) and which separate the inside of the piston in four enclosures (j''), (k''), (l''), (m''). The enclosures (j''), (m'') communicate with the inside of the inner cylinder through some holes (n''), (o'') and the enclosures (k''), (l'') may or may not communicate between them through some holes (p'') in the diaphragm (139). The membranes (137), (138) change their form at the pressure variations in the working cylinder exercised by the liquid coming into the piston through the communication holes (n''), (o'') in the superior/inferior wall, assuring thus the damping characteristic uniformization. The membranes may be strengthened or not with some springs (140), (141), (142), (143). A pressurized gas may or not be introduced in the enclosures (k''), (l''). The hydraulic shocks absorption degree is controlled through the rigidity of the membranes (137), (138), springs (140), (141), (142), (143), the pressurization degree of the gas in the enclosures between the membranes and the sizes of the calibrated holes. The strokes of the membranes are limited through some bumpers (144), (145), (146), (147).

The automotive self-adjustable damper with a dissipative self-correcting characteristic according to the nineteenth accomplishing example has a working piston (148), endowed inside with two little pistons (149), (150), equal or not in diameter, running in two rooms (q''), (r''), separated by a diaphragm (151). The little pistons (149),(150), may be equipped or not with some segments (152),(153) and a compressed gas may be or not introduced behind them. The running of the little pistons (149),(150), may be controlled by some springs (154),(155),(156),(157) and the stroke limited by some bumpers (158),(159),(160),(161). The (q'') enclosure communicates with the inner cylinder through some holes (s'') and the enclosure (r'') through some holes (t'') so the pressure variations in the innerr cylinder determine the movement of the little pistons (149),(150), assuring the damping characteristic uniformization. The hydraulic shocks damping degree is controlled both through the

calibration holes (s''),(t'') on the piston (148) and through the rigidity of the springs (154),(155),(156),(157) or through the pressure of the gas in chambers (q''),(r''), behind the little pistons and if there are through some holes (u'') in the diaphragm (151), assuring the communication between the chambers (q''), (r''), behind the pistons. The solution can be accomplished in the version without springs or a pressurized gas.

The automotive self-adjustable damper with a dissipative self-correcting characteristic according to the twentieth accomplishing example has a working piston (162), endowed with two little pistons (163),(164), the first inside the other one. The little piston (163) is endowed or not with a diaphragm (165) on which a spring (166) may lean, placed at the other end at the bottom of the greater piston (164). The movement of the little pistons (163),(164) is controlled through some springs (167),(168), placed between these and the inner sides of the piston (162). The little pistons (163),(164) and the inner sides of the piston (162) form some enclosures (v''), (w''), (x''), (y''). The enclosures (w''),(x'') may communicate between them through some holes (z''). The enclosure (v'') communicates with the inner cyliner through some holes (a''') and the enclosure (y'') through some holes (b'''). We may or not introduce a pressurized gas in the enclosures (w''), (x''). The two little pistons move at the variation of pressure in the inner cyliner under the action of the liquid penetrating through the holes (a'''), (b''') in the superior/inferior side of the piston (162) assuring the damping characteristic uniformization. The damping degrees are checked both through the calibrated holes (a'''), (b'''), (z'') and through the spring rigidity (158), (159), (160) placed between the pistons and the inner sides of the piston (162) as well as through the pressure of the gas in chambers (w''), (x'') inside the little pistons. The little pistons strokes can be checked through some bumpers (169), (170), (171). The solution can be also achieved in the version without springs or without compressed gas.

The automotive self-adjustable damper with a dissipative self-correcting characteristic according to the twenty-first accomplishing example has an inner cylinder (172), with one or several calibrated holes (c''') obturated with a ring/segment (173) made from a material having a thermal extension coefficient less then that of the material of the inner cylinder, determining the decrease of the distance between cylinders when the thermic regime increases causing the increase of the damping forces at warmth. The dotted line presents the state at cold and the continuous line presents the situation at warmth. In the diagram J_C represents the clearance at warmth and J_R the clearance at cold.

The automotive self-adjustable damper with a dissipative self-correcting characteristic according to the twenty-second accomplishing example has in its inner cylinder (174) one or several calibrated holes (d'''), obturated with one or several

sharp plungers (175) made from a material having a thermal extension coefficient greater than of the material the inner cylinder (174) is made from and fixed on the outer cylinder (176) which determines the penetration of the plunger/s (175) in the calibrated hole (d''') when increasing the temperature, position determining in its turn the incease of the damping forces. The state of cold is presented with a dotted line in the diagram and the state at warmth with a continuous one. J_C represents the clearance at warmth and J_R the clearance at cold.

The automotive self-adjustable damper with a dissipative self-correcting characteristic according to the twenty-third accomplishing example has one or more callibrated holes (e''') in the inner cylinder (177), obturated with one or several closers (178) made from a material with a thermal expansion coefficient greater to the one of the material the inner cylinder (177) is made from and fixed on the outer cylinder (179) which determines the closer/s (178) to obturate stronger the hole/s calibrated when the temperature increases , situation determining in its turn the increase of the damping forces. A dotted line represents the situation at cold and a continuous one the situation at warmth. J_C represents the clearance at warmth and J_R the clearance at cold.

The automotive self-adjustable damper with a dissipative self-correcting characteristic according to the twenty-fourth accomplishing example has a inner cylinder (180), a superior (181) block , an inferior block (182) and a piston (183), equipped with adjustable valves (184), (185), (186), (187), (188) having the possibility of changing the damping characteristic in real time. The control of the valve adjustment is done through the control of the relative position of the obturation elements of the discharge valves of the liquid or through the control of the forces of pressing the valve plater or through t he control of the sizes of the calibrated holes, being able to be accomplished mechanically, hydraulically, pneumatically, electrically or electromagnetically, continuously, discretely or in steps. The inner cylinder (180), the superior block (181), the inferior block (182), contain filling valves (189), (190), (191). The filling valves can be reduced to two , one in the superior part for compression and one in the inferior part for rebound. The checking valves (185) placed in the superior block (181) and / or (186) placed in the inferior block may be missing. The superior block (181) contains a guidance (192) too.

The automotive self-adjustable damper with a dissipative self-correcting characteristic according to the twenty-fifth accomplishing example has an inner cylinder (193), with one or several holes calibrated (f'''), obturated as wanted by different calibre holes (g''') in a concentric cylinder (194) with the inner cylinder and having the possibility of rotating as against it. Function of the relative position

of the two cilinders the working fluid may flow through one or several holes of different sizes achieving thus the adjustment in stages of the damping characteristic.

The automotive self-adjustable damper with a dissipative self-correcting characteristic according to the twenty-sixth accomplishing example has on the inner cylinder (195), one or several canals (h''') obturated as wanted more or less by the concentring ring (196) with one or several canals (i'''). Function of the relative position of the two cylinders the working fluid may flow through a slot with a smaller or bigger surface assuring thus the dissipation characteristic wanted.

The automotive self-adjustable damper with a dissipative self-correcting characteristic according to the twenty-seventh accomplishing example has some holes (j'''), (k''') on the inner cylinder (197), which are obturated as wished by the edge of a concentric cylinder (198) conveniently profiled (l'''). The moving of the ring (198) as to the cylinder (197) eliberates a different number of holes determining the modification of the damping characteristic.

CLAIMS

1. Automotive self-adjustable damper with self-correcting dissipative characteristic made up of a piston (2) with checking rebound valve (17) and checking compression valve (16), running due to a rod (1) inside to an inner cylinder (3), on whose length there are checking rebound valves (18) and checking compression valves (19) and probably filling rebound valves (20) and filling compression valves (21) and closed at its ends by a superior block (5) containing a guide (6) and may be a checking rebound valve (14) and probably a filling compression valve (15) and through an inferior block (4) containing probably a checking compression valve (12) and probably a filling rebound valve (13), so that the unit should contain at least a checking rebound valve (18) and a checking compression valve (19), which can be even one (18) or (19) being checking rebound valve or checking compression valve, placed in the inner cylinder (3) as well as at least a filling rebound valve (13)/ (20) and at least one filling compression valve (15)/ (21), placed at the ends , all the valves being permanently floated, state favoured by the oil reserve above the valves, equal with at least the volume of the stroke of the rod (1), maintained in a dynamic regime through a superior labirynth system (7), whole unit being introduced in an outer cylinder (8) having the role of an oil tank, protection, strength, closed by a lid (9) containing an air volume at least equal with the one of the rod stroke, assuring the sealing of the rod (1) through a sealing (10) fitting, solution determining small damping forces at the beginning of the rebound, respectively compression stroke, due to the fact that the liquid is discharged through several valves, which favour the returning of the oscilating mass in the medium position and the comfort, while when the piston (2) approaches to ends the damping forces increase due to the reduction of the active checking valves number assuring the breaking of the oscilatory mass movement, having favourable consequences on the stability and on the decrease of the impact at the end of the stroke, the solution being accomplished with the unit either nonpressurized or presurized at a low pressure for improving the damping characteristic stability, either medium pressurized for medium upward forces, or highly pressurized for high upward forces when using it as a balancer .

2. Automotive self-adjustable damper with self-correcting dissipative characteristic according to the claim 1, characterized by the fact that for reducing the dimensions and for simplicity, the superior (27) and inferior (29) blocks, contain or not a filling valve (28), (30) respectively and the inner cylinder (22) contains the checking (23) valves and probably a single filling rebound valve (26) and a single filling compression valve (26), at ends, so that the unit should contain

only one filling rebound valve (26)/ (30) and only one filling compression valve (25)/ (28).

3. Automotive self-adjustable damper with self-correcting dissipative characteristic according to claims 1and 2, characterized by the fact that the rod (1) is guided both by the guidance (6) in the superior block (5) and by a guidance (33) placed at the closing lid (31) near the sealing element (32) for a better taking over of the lateral strains and a better centring of the sealing element (32) as to the guidance (33).

4. Automotive self-adjustable damper with self-correcting dissipative characteristic according to the claims 1 and 2, characterized by the fact that for a better taking over of the lateral forces and a better centring, the superior block (34) contains besides a checking rebound valve (35) and a filling compression valve (36), both the guidance (37) and the sealing element (38), the labirynth system (39) being specific to the new configuration and the sealing of the closing lid (40) as to the superior block (34) being achieved through a sealing element (41).

5. Automotive self-adjustable damper with self-correcting dissipative characteristic according to claims 1,2,3 and 4, characterized by the fact that the piston (2) is placed to the center of the rod (42) this being guided and by a guidance (43) placed in the inferior block (44) containing also a checking compression valve (46) and a filling rebound valve (47), the rod (42) being sealed in the lower part by a sealing (45) element, placed in the inferior part of the outer cylinder (199), solution in which the labirynth system and the rod volume compensating system are necessary only when the diameters of the rod are unequal, so that the closing lid (48) becomes smaller.

6. Automotive self-adjustable damper with self-correcting dissipative characteristic according to claims 1,2,3 and 4, characterized by the fact that the inner cylinder (50) has checking valves (51) and filling valves (52), on the upper part placed at the end of some pipes (53), (54), (55) and (56), (57), (58) placed in the lower part of the outer cylinder (60), case in which the upper labyrinth systems replaced by some allayers (59) placed in the medium area, the outer cylinder (60), the superior block (61), the closing lid (62) and the sealing (63), (65) being specific.

7. Automotive self-adjustable damper with self-correcting dissipative characteristic according to claims 1,2,3,4 and 5, characterized by the fact that the rod volume compensation is achieved with the liquid within an enclosure (q) of a lateral chamber (66) fixed on the closing lid (67), with which communicates through a hole (r), forced by the pressure of the gas in an enclosure (s) formed on the bottom of the lateral (66) chamber and the pleated tube (68) separating the liquid from the gas, solution permitting the working no matter the position.

8. Automotive self-adjustable damper with self-correcting dissipative characteristic according to claims 1,2,3,4 and 5, characterized by the fact that the rod volume compensation is accomplished with the liquid contained in a lateral chamber (70) respectively (74), in direct contact with the atmosphere through the holes (v) respectively (y) and communicating with the lid (71) respectively (75) through a connecting tube (72), respectively directly, depending on solution, the compensation being favoured by the pressurization of the gas introduced in enclosures (t) respectively (w) placed in chamber (70) respectively (74), situation in which the holes (v)/ (y) are closed after pressurization.

9. Automotive self-adjustable damper with self-correcting dissipative characteristic according to claims 1,2,3,4 and 5, characterized by the fact that the rod volume compensation is achieved with the pressurized bladder (77) placed between the inner cylinder (3) and the outer cylinder (78), this, as well as the superior block (79) containing a guidance (80), a checking rebound valve (81) and a filling compression valve (82) , as well as the closing lid (83) containing the rod (1) sealing element (84) and the element for sealing the lid (83) with the outer cylinder (78) being specific.

10. Automotive self-adjustable damper with self-correcting dissipative characteristic according to claims 1,2,3,4 and 5, characterized by the fact that for the rod volume compensation one uses the liquid contained in an exterior pleated tube (86), concentric with the outer cylinder (87) and fixed on it by two constricted clamping rings (88), transfered through the communication holes (b') inside the cylinder (87) due to the pressure created by the tensioning of the pleated tube (86) with the springs (89), fixed in the housing (90) solidary with the outer cylinder (87) communicating with the atmosphere through the holes (d') or by the pressure of the gas in the chamber (c') between the pleated tube (86) and the housing (90), case in which the holes (d') are closed after presurization, or by both solutions.

11. Automotive self-adjustable damper with self-correcting dissipative characteristic according to claims 1,2,3 and 4, characterized by the fact that for the compensating the rod volume one uses the liquid contained in a chamber (e') at the inferior extension of the outer cylinder (94), forced to communicate with the lateral enclosure (g') between the inner cylinder (3) and the outer cylinder (94), through the holes (i') in inferior block (93), by the floating piston (95), pushed by the pressurized gas located in enclosure (j') between the floating piston (95) and the end of the cylinder.

12. Automotive self-adjustable damper with self-correcting dissipative characteristic according to claims 1,2,3 and 4, characterized by the fact that for

the compensating the rod volume one uses the liquid contained in a chamber (l'), located in the lower extension of the outer cylinder (102), forced to communicate with lateral enclosure (o') placed between inner cylinder (3) and outer cylinder (102) through the holes (p'), by the floating piston (103), located in the support (101) solidary with the outer cylinder (102), pushed by the pressurized gas from chamber (n') placed at lower end of the outer cylinder (102), which can communicate with the exterior through the hole (r') in outer cylinder (102), the floating piston (103) stroke being limited by the stoppers (104), (105) placed in the support (101).

13. Automotive self-adjustable damper with self-correcting dissipative characteristic according to claims 1,2,3 and 4, characterized by the fact that for the compensating the rod volume it uses the liquid in a chamber (s'), located in the lower extension of the outer cylinder (108), forced to communicate with the lateral enclosure (x'), between the inner cylinder (3) and the outer cylinder (108) through the holes (z') and later on through the holes (y') on the support (109) solidary with the lower part of the outer cylinder (108), by the floating piston (110), driven by the pressure of the gas in chamber (u') in the support (109), the piston stroke being limited by stoppers (111),(112), placed on the support walls (109).

14. Automotive self-adjustable damper with self-correcting dissipative characteristic according to claims 1,2,3,4,5,6,7,8,9,10,11,12 and 13, characterized by the fact that for building simplicity for different sections or all along its length, the inner cylinder (117) has its checking valves reduced to calibrated holes/slots (b''), (c''), (d''), the number of these being according to the desired damping characteristic, at its ends the inner cylinder (117) may have or not a filling rebound valve (119) and/or a filling compression valve (118), the piston (122) does not have valves, the superior block (115) may have or not a hole (a'') as a checking rebound valve and/or a filling compression valve (120) and the inferior block (116) may have or not a hole (e''), as a checking compression valve and /or a filling rebound valve (121), so that the unit should contain at least a filling rebound valve (119)/(121) and at least a filling compression valve (118)/(120).

15. Automotive self-adjustable damper with self-correcting dissipative characteristic according to claims 1,2,3,4,5,6,7,8,9,10,11,12,13 and 14, characterized by the fact that for building simple, sections of the inner cylinder or all the inner cylinder (123) are made from a poros material with a controlled capilarity and the superior block (125) contains only a filling compression valve (124) and inferior block (127) contains only a filling rebound valve (126).

16. Automotive self-adjustable damper with self-correcting dissipative characteristic according to claims 1,2,3,4,5,6,7,8,9,10,11,12,13,14 and 15,

characterized by the fact that for damping characteristic uniformization and increasing the comfort for small unevennes of the ground, it uses a piston (129) containing an elastic membrane (130) inside, formed by the walls of the piston (129) two enclosures (f''), (g''), the membrane (130) distorted by the pressure difference of the liquid entering the two chambers (f''),(g''), through the calibrated holes (h''),(i'') on the faces of the piston (129), the membrane (130) being controlled or not by two springs (131),(132) supported on the faces of the piston (129), the system sensibility depending on the membrane (130) elasticity, springs (131), (132) and on the number, surface and form of the slots (h''), (i'') which permit the access of the liquid in the piston, the membrane stroke being controlled by stoppers (133), (134) placed on the inner sides of the piston.

17. Automotive self-adjustable damper with self-correcting dissipative characteristic according to claims 1,2,3,4,5,6,7,8,9,10,11,12,13,14 and 15, characterized by the fact that for damping uniformization and the increase of the comfort for small unevenness of the ground, uses a piston (136) containing inside two membranes (137),(138) placed on either side of a central diaphragm (139), placed in the center of the piston (136), forming four chambers (j''),(k''),(l''),(m''), the chambers (k''),(l'') on either side of the diaphragm (139) may contain or not a pressurized gas and communicating between them through some calibrated holes (p'') in diaphragm (139) and the chambers (j''),(m'') placed on the superior and inferior part of the piston (136), communicating with the inner cylinder through some calibrated holes (n''),(o''), the two elastic membranes (137),(138) may be controlled or not by springs (140), (141), (142),(143), placed between the wall of the piston (136), the membranes (137), (138) and diaphragm (139), whose strokes to the interior are limited by the bumpers (145), (146), placed on the diaphragm (139) and to the exterior being controlled by bumpers (144),(147), placed on the inner sides of the piston (136), the sensibility of the system depending on the membrane (137), (138) elasticity, on the springs (140), (141), (142), (143) elasticity, the pressure of the gas in the central enclosures (k''), (l'') and on the number, surface and form of the inner slots (p'') and of the exterior ones (n''), (o'') which permit the access of the liquid in the piston.

18. Automotive self-adjustable damper with self-correcting dissipative characteristic according to claims 1,2,3,4,5,6,7,8,9,10,11,12,13,14 and 15, characterized by the fact that for damping characteristic uniformization and increase of the confort for small unevenness of the ground, it uses a piston (148), containing inside two little pistons (149), (150) of equal or unequal diameters placed in two chambers (q''), (r''), formed by a diaphragm (151) placed in the centre of the piston (148) and solidary with this, containing or not communication

slots (u''), behind the pistons (149), (150), being introduced or not presurized gas, these being driven by the pressure of the liquid entering the two chambers (q''), (r''), through slots (s''), (t'') on the faces of the piston (148), the little pistons (149), (150) having the strokes controlled or not and through four springs (154), (155), (156), (157), the stroke of the little pistons (149), (150) to the interior being limited by bumpers (159), (160) placed on the diaphragms (151) and to the exterior being controlled by the bumpers (158), (161) placed on the inner sides of the piston (148), the sensibility of the system depending on the pressure of the gas between the pistons (149), (150) and/ or the springs (154), (155), (156), (157) elasticity, on the number , surface and the form of the interior slots (u'') and of the exterior ones (s''), (t''), which allow the acces of the liquid in the piston.

19. Automotive self-adjustable damper with self-correcting dissipative characteristic according to claims 1,2,3,4,5,6,7,8,9,10,11,12,13,14 and 15, characterized by the fact that for damping characteristic uniformization and the increase of the confort for small unevenness of the ground, it uses a piston (162) containing two little pistons inside, one (163) containing or not a diaphragm (165) with or without calibrated holes (z''), defining an enclosure (w''), being located inside the other piston (164), the little pistons (163), (164) forming in the interior of piston (162) two enclosures (v''), (z''), which communicates with inner cylinder through some calibrated slots (a'''), (b''') in wall of the piston (162), the little pistons (163), (164) being controlled or not by springs (166), (167), (168), placed between the diaphragm (165) and the bottom of the piston (164) and between the interior of the piston (162) and the faces of the two little pistons (163), (164), between which a pressurized gas may be introduced or not, the strokes of the little pistons (163), (164) may be limited to the interior by the bumper (170), placed on the diaphragm (165) and to the exterior by bumpers (169), (171) placed on the inner sides of the piston (162), the system sensibility depending on the pressure of the gas between little pistons, the elasticity of the springs (166), (167), (168) and on the number, surface and form of the slots (z'') on the diaphragm (165) and of the exterior ones (a'''), (b''') on the sides of the piston (162).

20. Automotive self-adjustable damper with self-correcting dissipative characteristic according to claims 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18 and 19, characterized by the fact that for assuring the thermal stability, round the inner cylinder (172) at the level of one or several slots (c''') in inner cylinder (172), there are located one or several rings/segments (173), made from a material having a thermal expansion coefficient smaller then the one of the material the inner (172) cylinder is made from, so that when increasing the temperature the clearance between the inner cylinder (172) and the ring/s should decrease and thus

to increase the pressure necessary for the liquid passing through this/these slot/s, compensating the decrease of the hydraulic efficiency generated by the increase of the clearance between piston and the inner cylinder and the decrease of the oil viscosity.

21. Automotive self-adjustable damper with self-correcting dissipative characteristic according to claims 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19 and 20, characterized by the fact that for assuring the thermal stability one or several slots (d''') respectively (e''') in the cylinder (174) respectively (177), is obturated controlled by sharp plunger/s (175) respectively closer/s (178) of a convenient form made from materials with thermal expansion coefficients grater than the material the inner cylinder is made from, fixed on the outer cylinder (176), respectively(179), reducing thus the play between the plunger/s and closer/s and inner cylinder (174) respectively (177) generating the increase of the pressure necessary for the passing of the working liquid through these valves and thus compensating thus the decrease of the hydraulic efficiency generated by the possible increase of the play between piston and the inner cylinder and the decrease of the oil viscozity.

22. Automotive self-adjustable damper with self-correcting dissipative characteristic according to claims 1,2,3,4,5,6,7,8,9,10,11,12,13,14 and 15, characterized by the fact that it has a piston (183),an inner cylinder (180), a superior block (181), an inferior block (182) equipped with checking valves (187), (188), (184), (185), (186) with the possibility of modifying the dissipation characteristic in real time, the control of the valve check being permanently , discretely , or in step made, by controlling the relative position of the obturating elements of the liquid discharging holes/slots, or by controlling the pressing forces of the valve plates, or by controlling the sizes of the calibrated holes/slots, being achieved mechanically, hydraulically, pneumatically, electrically, or electromagnetically, or by a combination of them, allowing the achieving of a semiactive damper, the inner cylinder (180), the superior block (181) and the inferior block (182), having filling valves (189), (190), (191) which can be reduced to two, one filling compression valve in the superior area and one filling rebound valve in the inferior area and with the checking valve (185) placed in the superior block (181) and/or ckecking valve (186) in the inferior block (182) may be missing.

23. Automotive self-adjustable damper with self-correcting dissipative characteristic according to claims 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20 and 21, characterized by the fact that over the slots (f'') in the inner cylinder (193) are superimposed slots

(g''') of different forms and sizes placed in one or several rings (194), placed round the inner cylinder (193), the desired combination being obtained by rotating the exterior ring (194) relative to the inner cylinder (193), which allows the changing of the damping coefficient in stages.

24. Automotive self-adjustable damper with self-correcting dissipative characteristic according to claims 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20 and 21, characterized by the fact that over the slots (h'''), in the inner cylinder (195) there are superimposed slots of different forms and sizes (i'''), applied in one or several outer rings (196), placed concentrically with the working cylinder, the degree of superimposing of the slots being obtained by rotating the outer ring/s, fact allowing the permanent change of the damping coefficient.

25. Automotive self-adjustable damper with self-correcting dissipative characteristic according to claims 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20 and 21, characterized by the fact that the slots (j'''), (k''') in the inner cylinder (197) are obturated progressively by rotating an outer ring (198) and whose edges (l''') are cut according to a convenient profile thus obtaining the change of the damping coefficient function of the number of obturated slots.

26. Automotive self-adjustable damper with self-correcting dissipative characteristic according to claims 1,...,25, characterized by the fact that for realise the damping characteristic the inner cylinder may be equipped with checking valves, holes/slots, poros material, in diverse combinations.

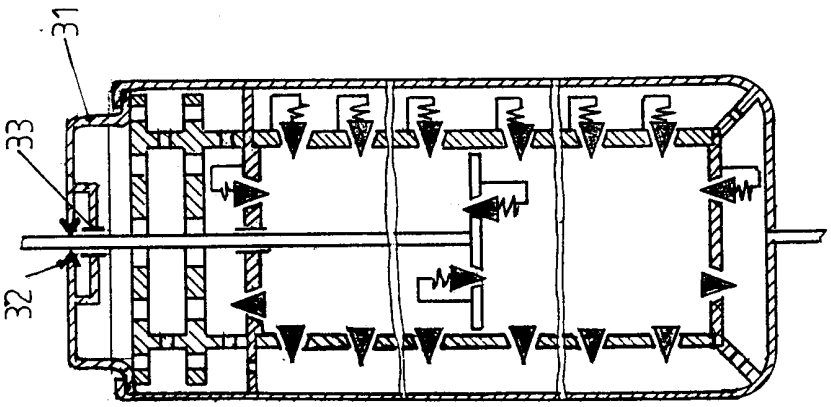

Fig.3

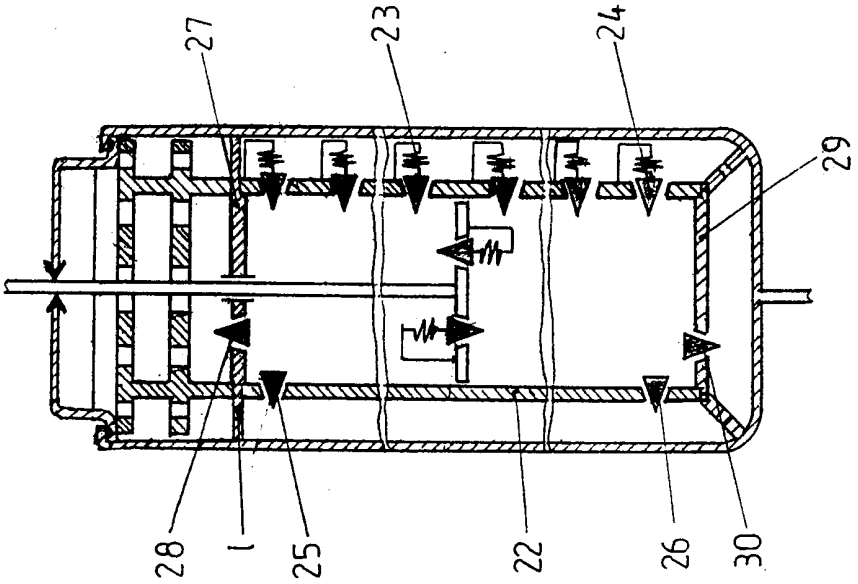

Fig.2

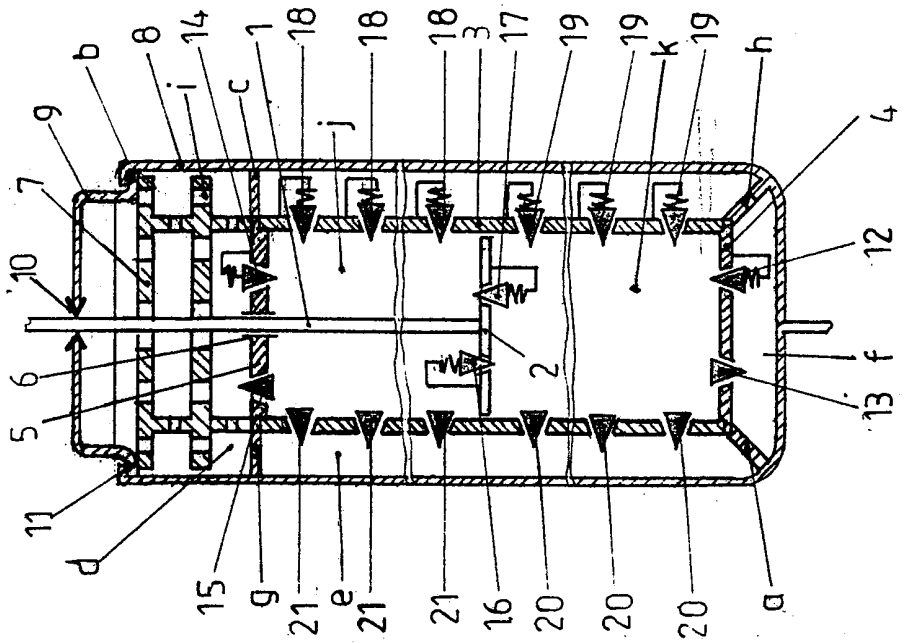

Fig.1

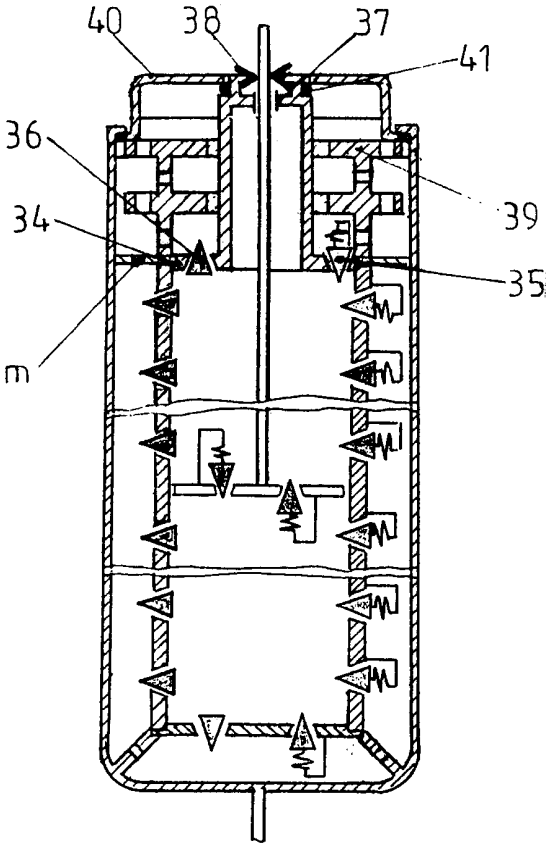

Fig.4

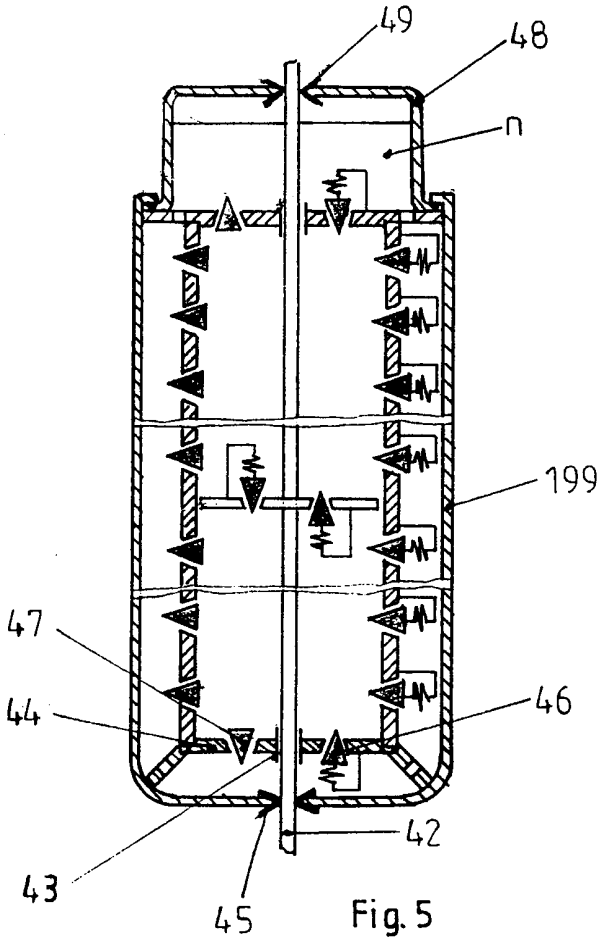

Fig. 5

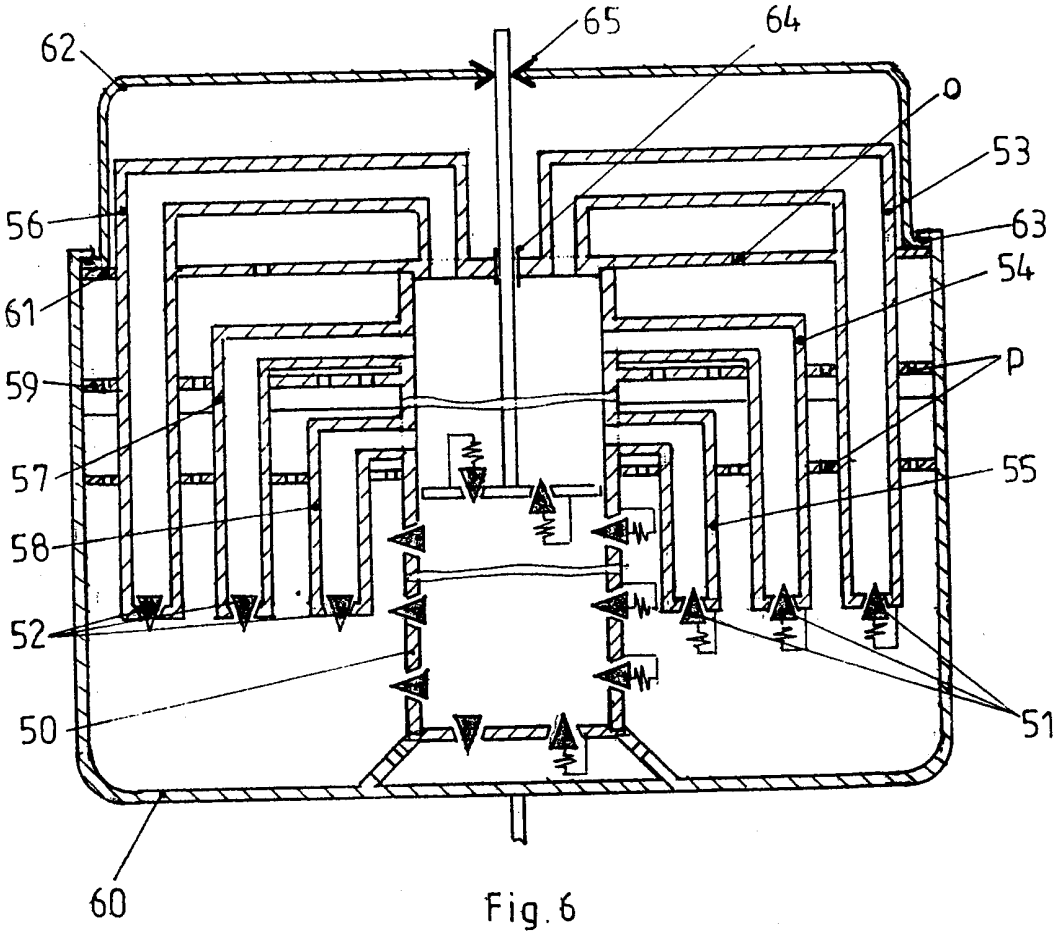

Fig. 6

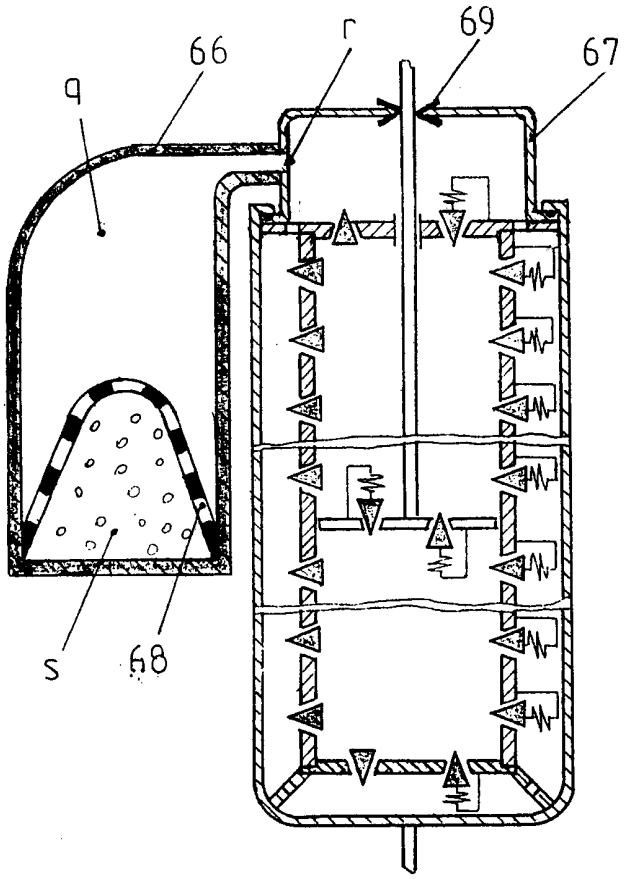

Fig.7

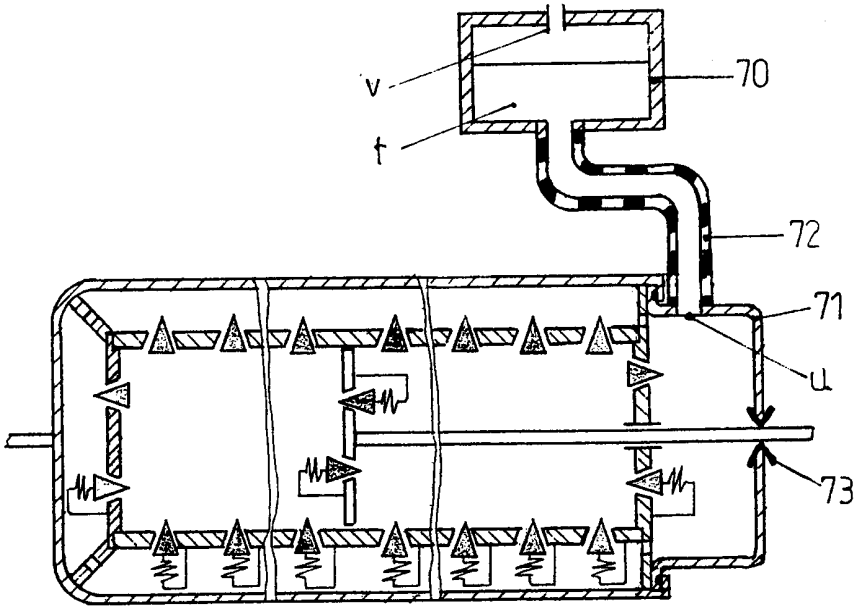

Fig.8

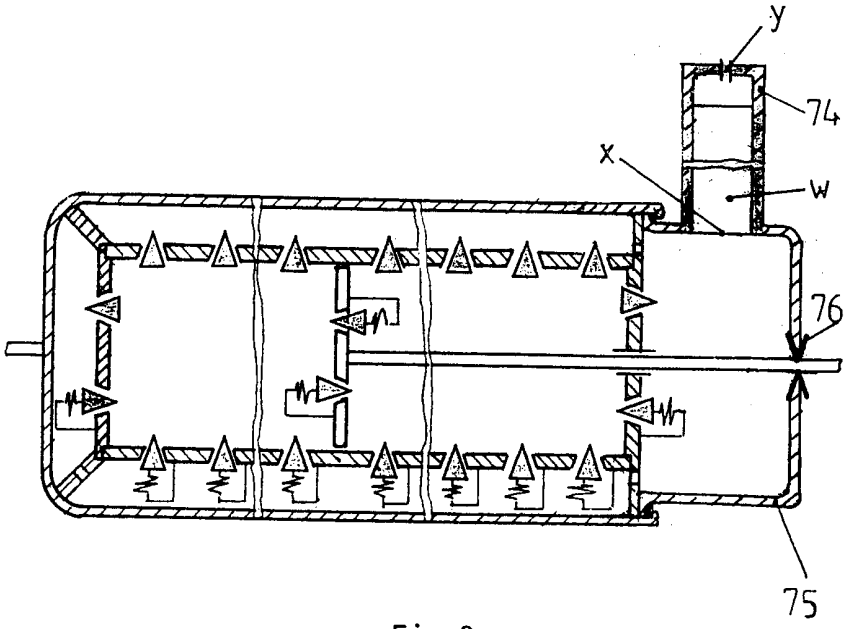

Fig.9

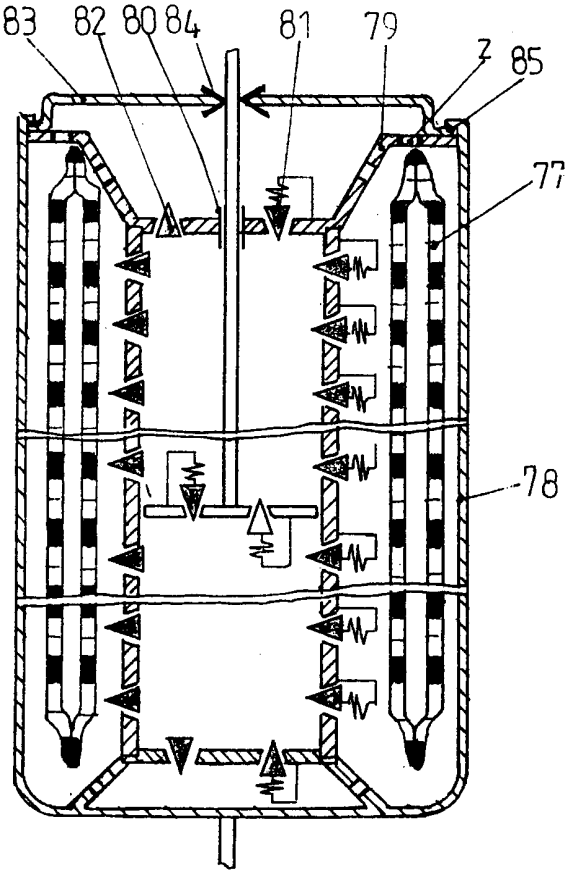

Fig.10

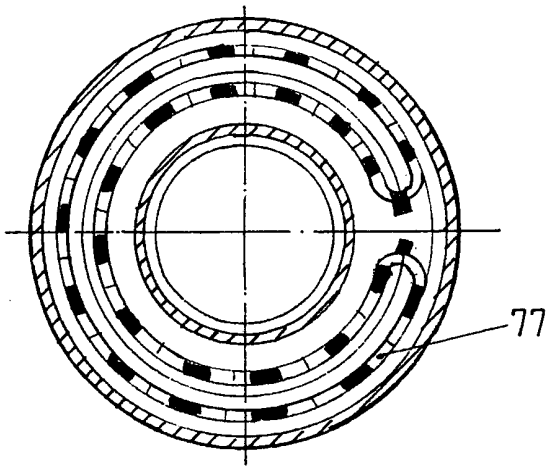

Fig.11

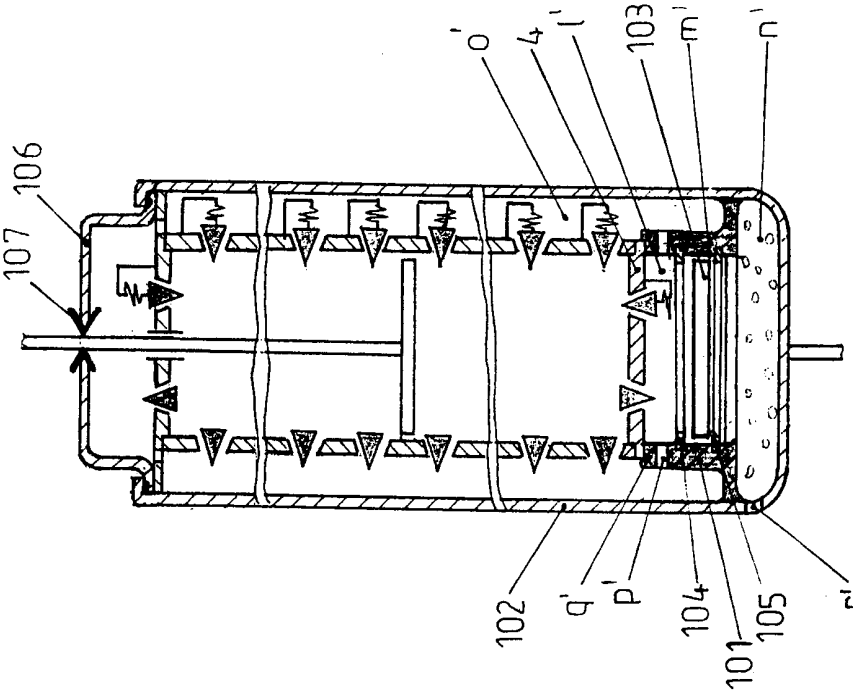

Fig.14

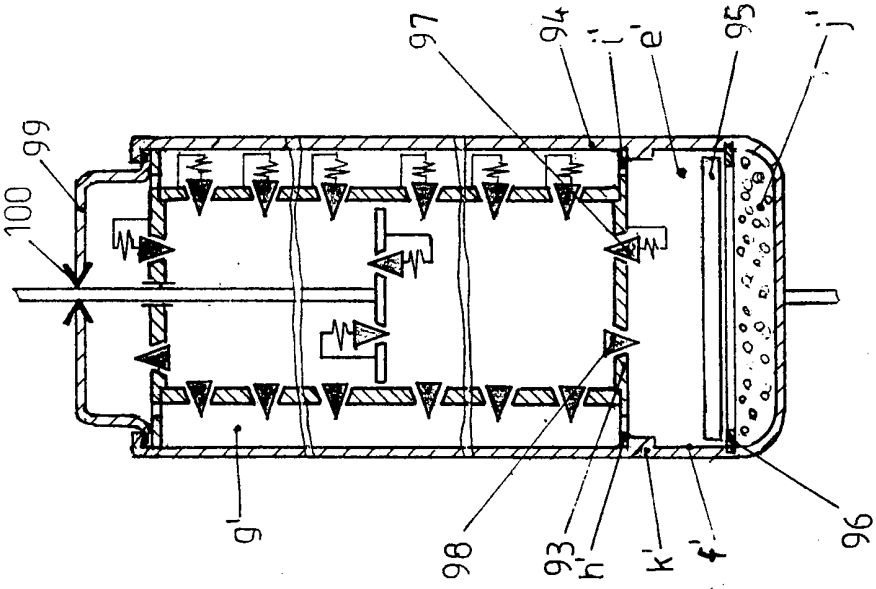

Fig.13

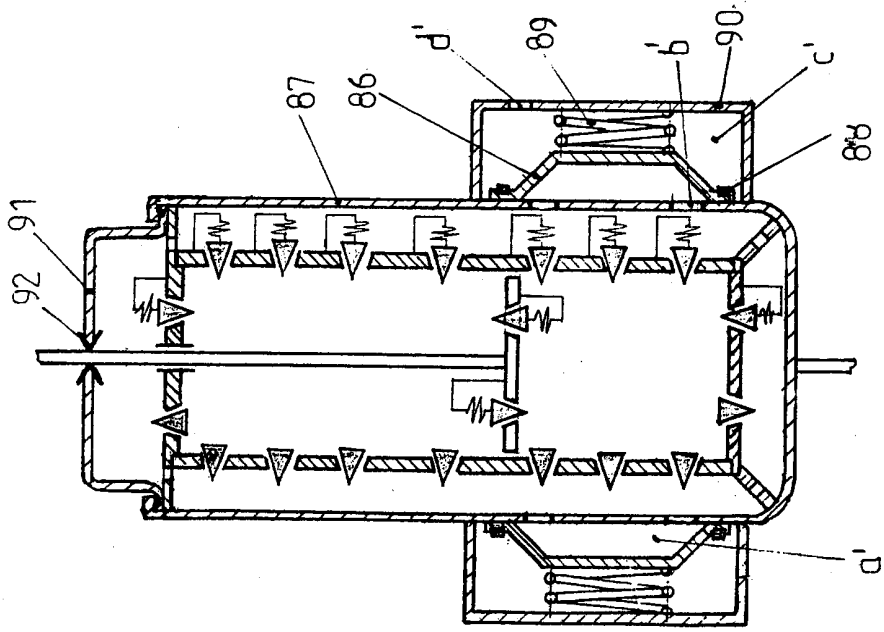

Fig.12

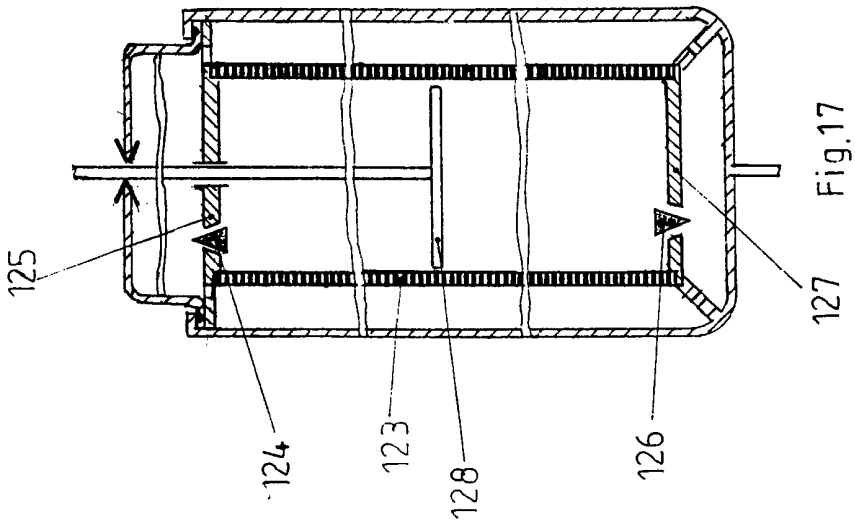

Fig.17

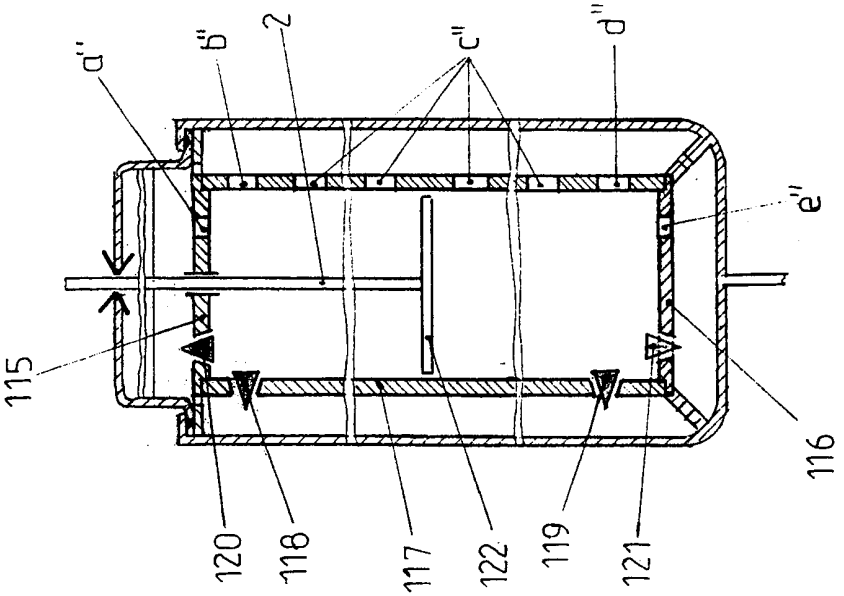

Fig.16

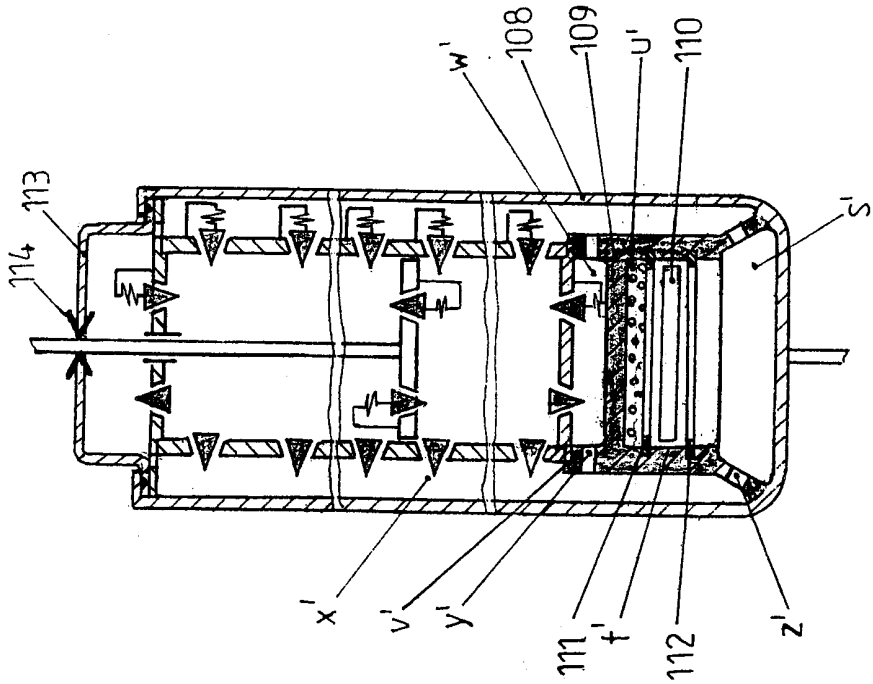

Fig.15

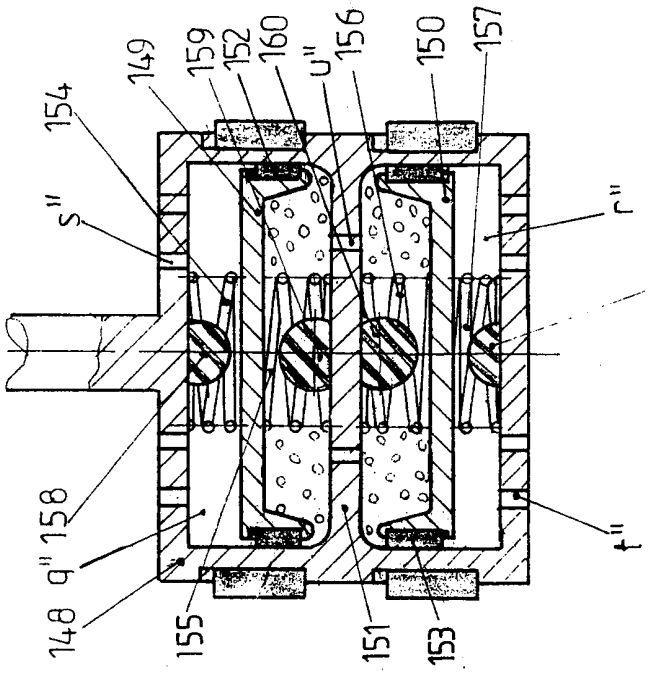

Fig.20

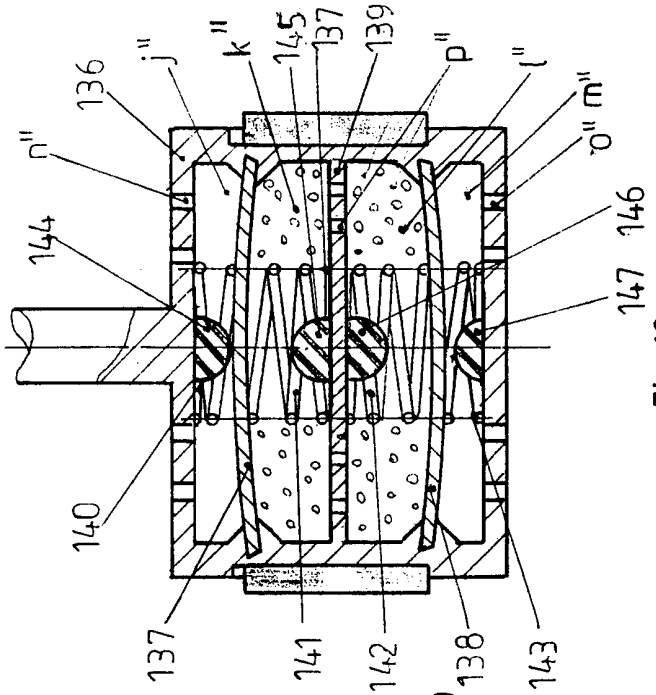

Fig.19

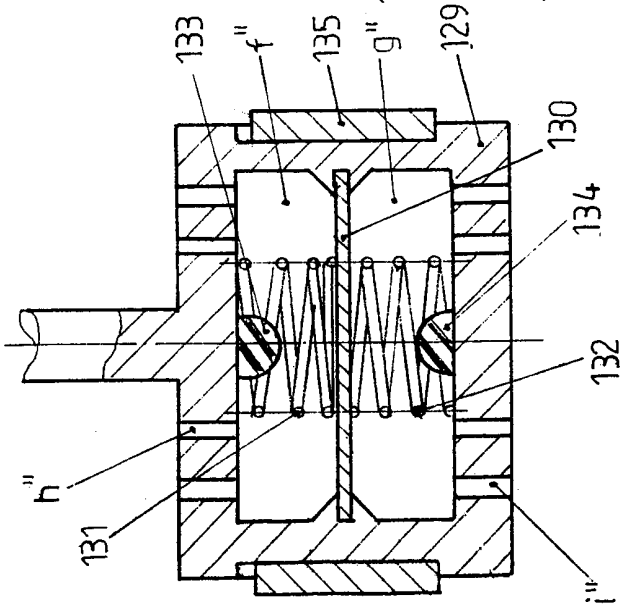

Fig.18

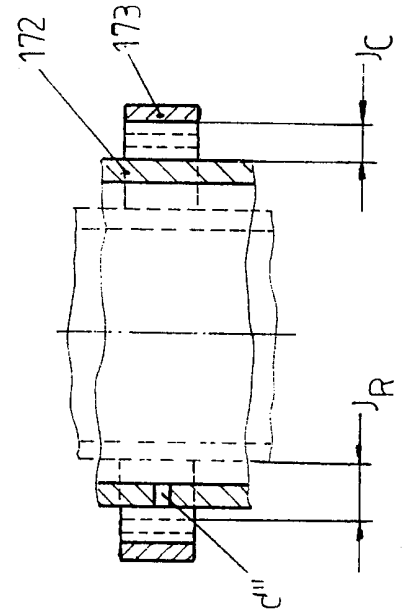

Fig.23

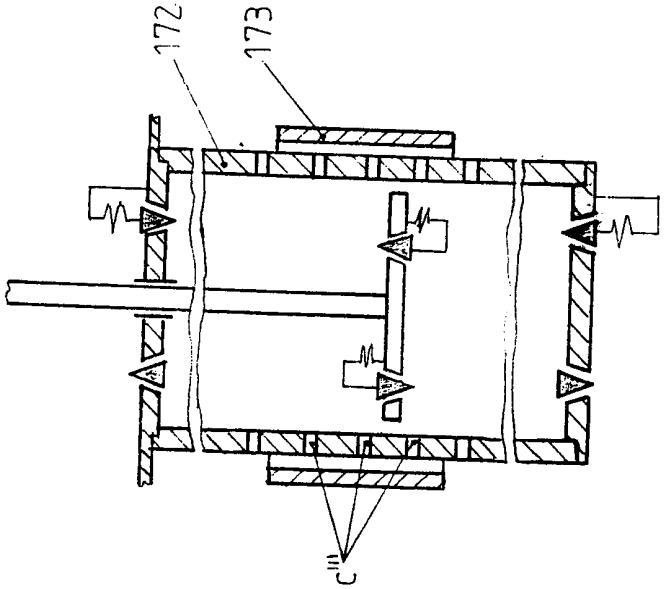

Fig.22

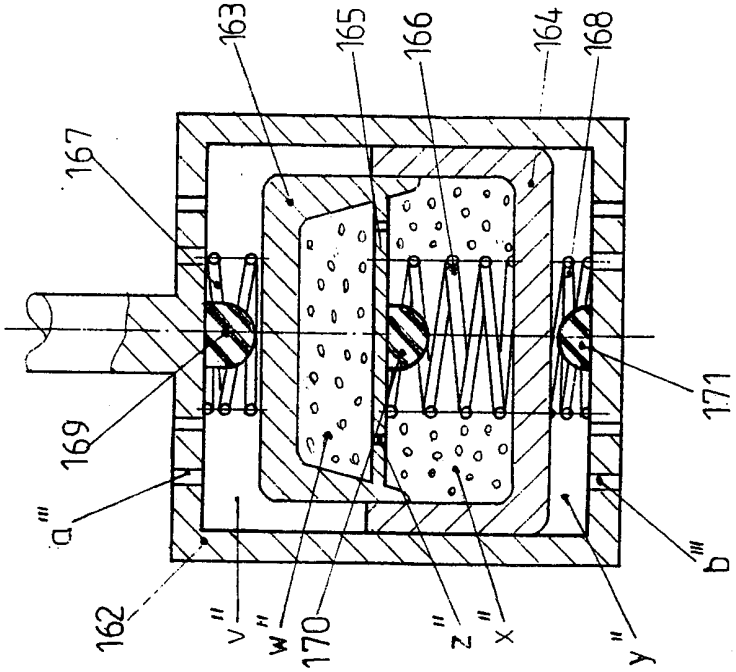

Fig. 21

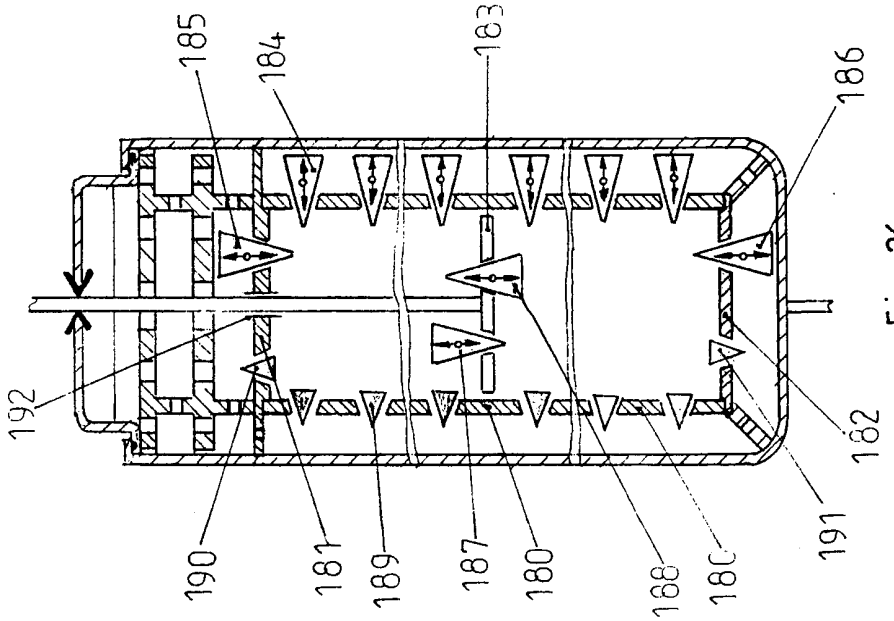

Fig. 26

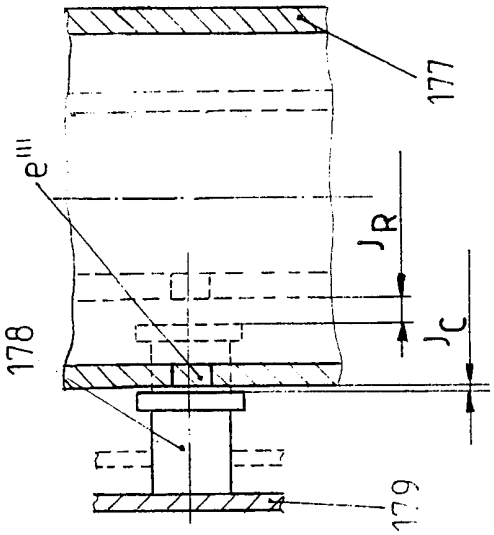

Fig.25

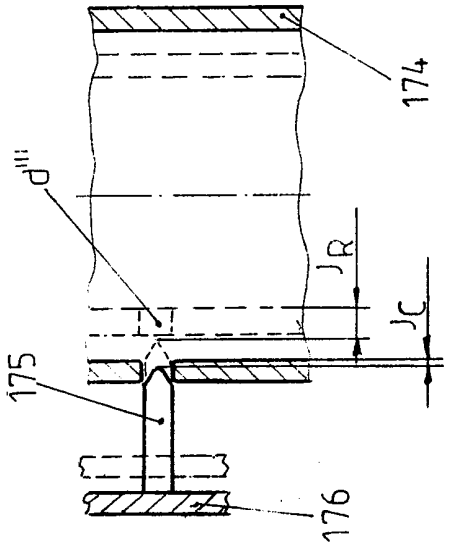

Fig.24

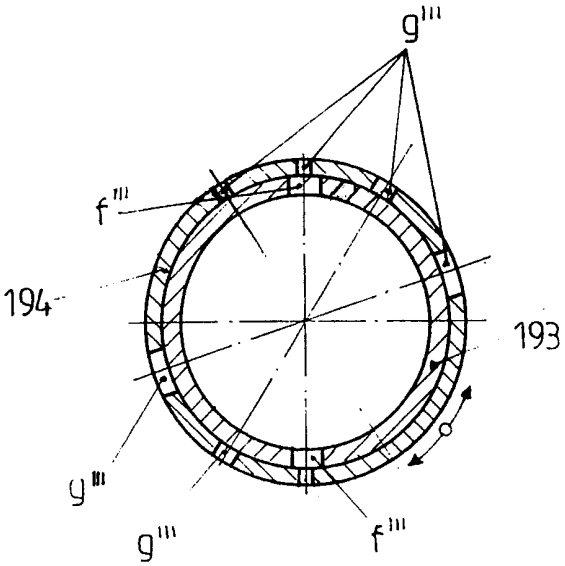

Fig.27

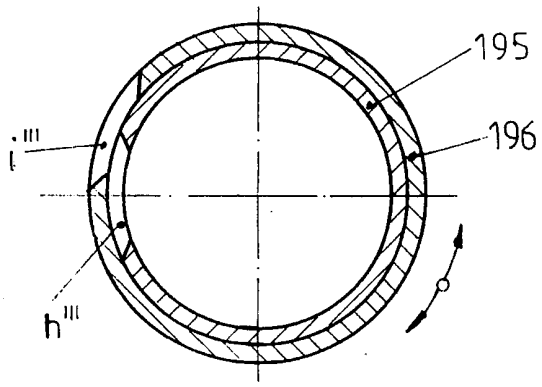

Fig.28

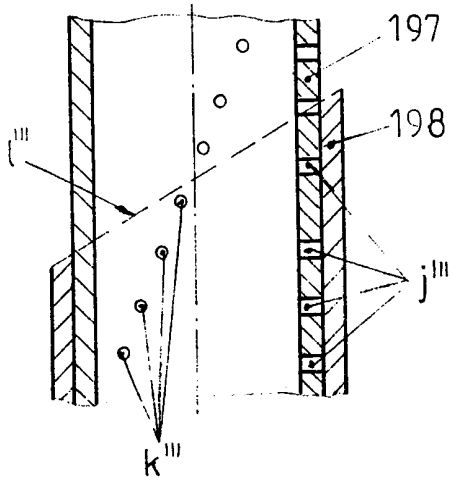

Fig.29

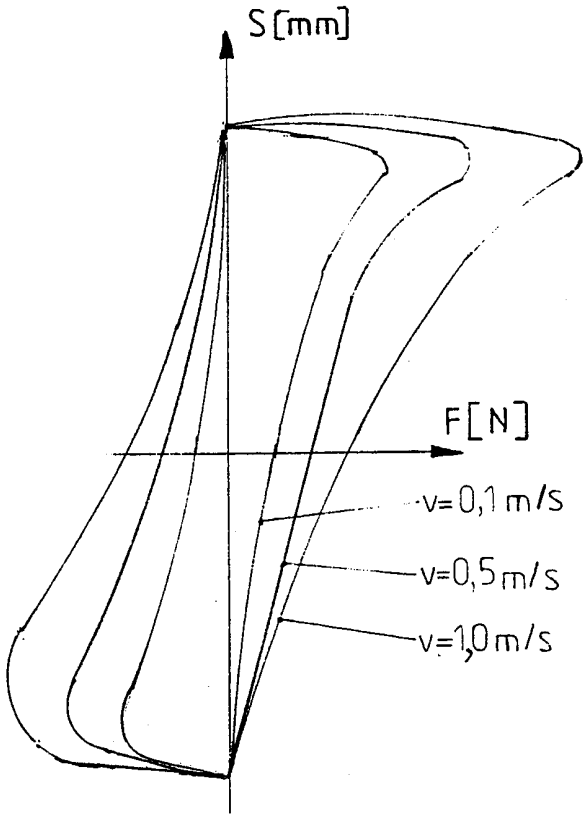

Figura 30