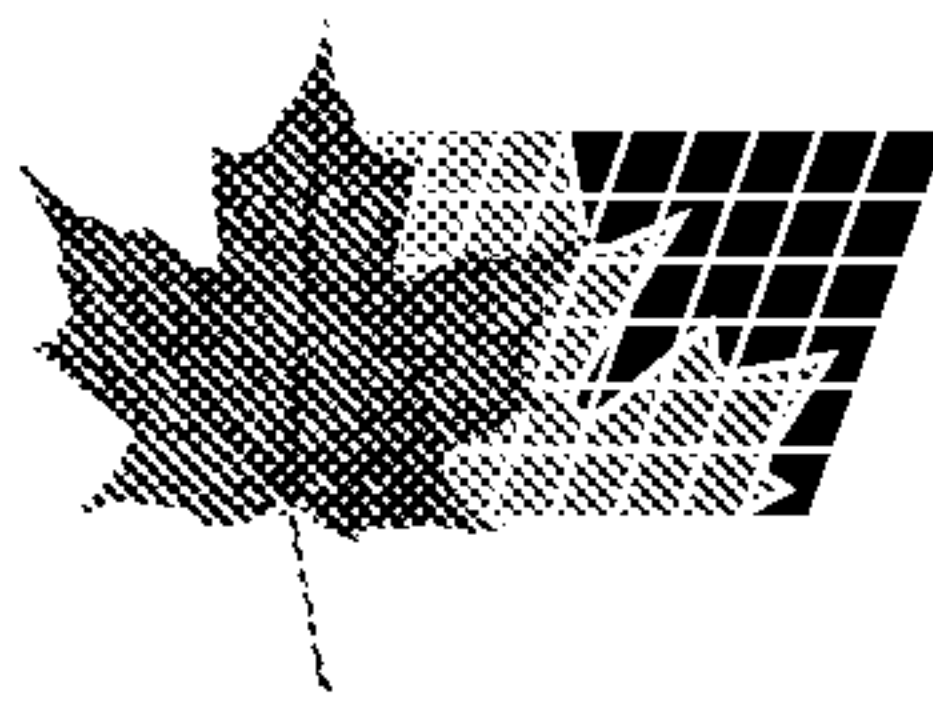




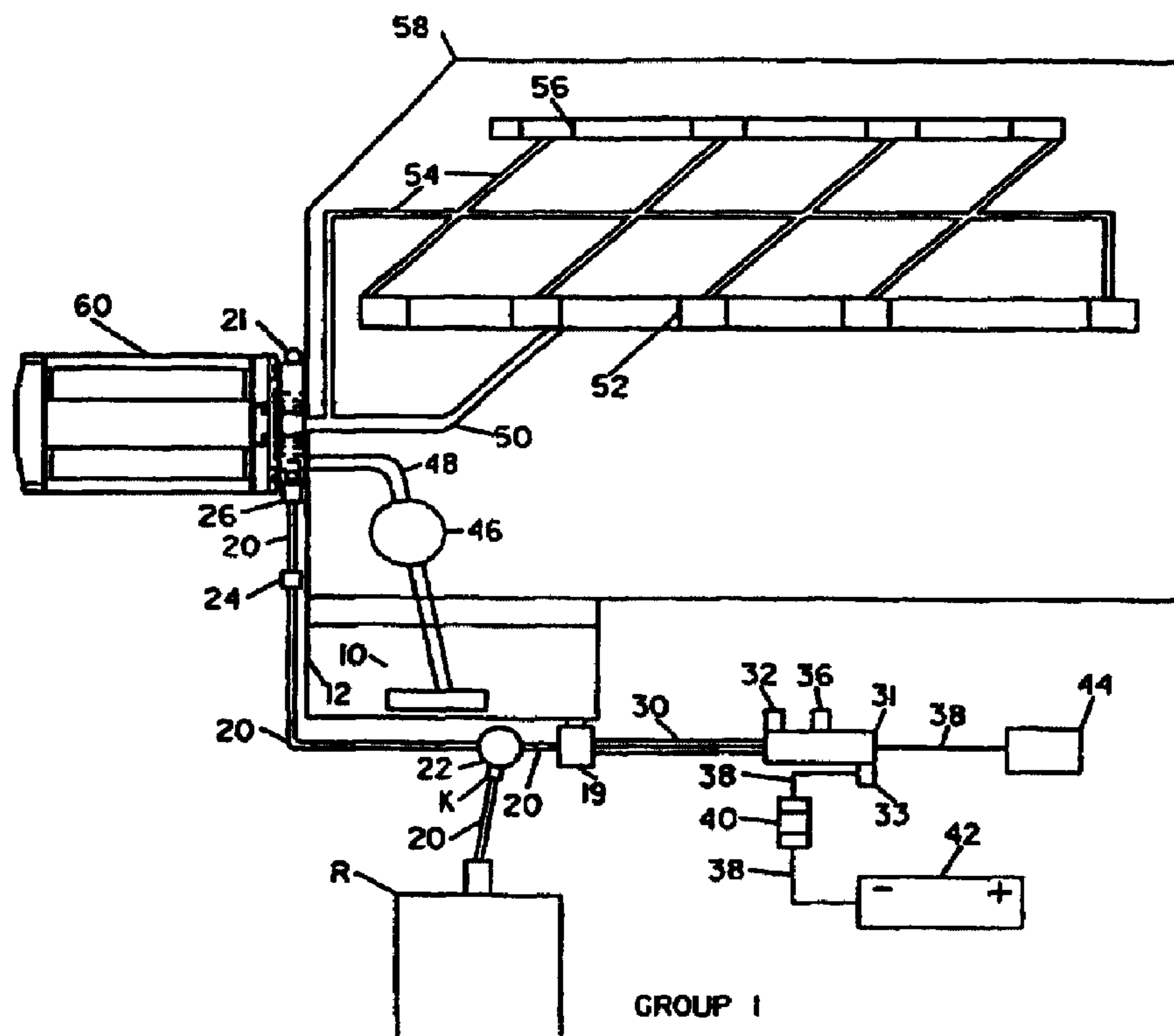
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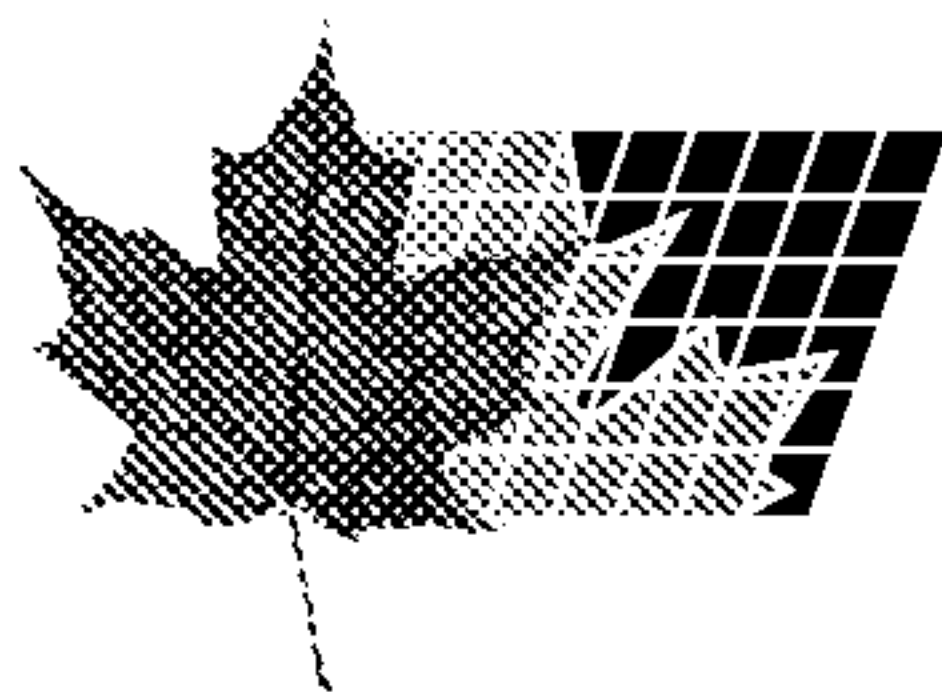
(54) **SYSTEMES DE PRELUBRIFICATION ET PROCEDE
CORRESPONDANT**

(54) **PRELUBRICATION SYSTEMS AND METHOD**



(57) Cet appareil retardant automatiquement l'usure d'un moteur à combustion interne est constitué d'une pompe électrique (19), d'un mécanisme de débranchement (26), d'un filtre à haut pouvoir filtrant (60), d'une unité de commande logique programmable (36) et d'une unité extérieure de commande (44). L'unité de commande logique programmable (36), qui est reliée à un accumulateur (42) de type courant, commute systématiquement l'alimentation de commande de l'accumulateur vers la pompe électrique et ce, en fonction d'un programme de cycle de fonction de commande programmé et est fonctionnellement

(57) An apparatus for automatically preventing wear in an internal combustion engine includes an electric pump (19), a disconnect coupling (26), a high arrestance filter (60), a programmable logic control element (36), and an external controller (44). The programmable logic control element is connected to a normally provided battery (42) and automatically switches control power from the battery to the electric pump according to a programmed control operating cycle program, and is operatively independent of ignition switch activation or operator action. The inlet of the electric pump is connected to the normally provided engine oil sump (12) for removing



indépendante de la mise en marche du contacteur ou de l'intervention d'un opérateur. L'entrée de la pompe électrique est reliée au carter huile moteur (12) pour l'enlèvement du liquide de lubrification. Une fois pompé, celui-ci traverse le filtre à haut pouvoir filtrant, ce qui permet d'obtenir un liquide de lubrification quasiment exempt de contaminant qui, après être passé par un radiateur, alimente le système de lubrification (54). L'unité de commande extérieure, par exemple une commande à distance, est destinée à actionner la pompe à la demande.

lubricating fluid. The lubricating fluid is pumped through the high arrestance filter, yielding a substantially contaminant free lubricating fluid which after flowing through a radiator is discharged into the normally provided engine lubricating gallery (54). The external controller, such as a wireless remote control, is provided to activate the pump remotely upon demand.

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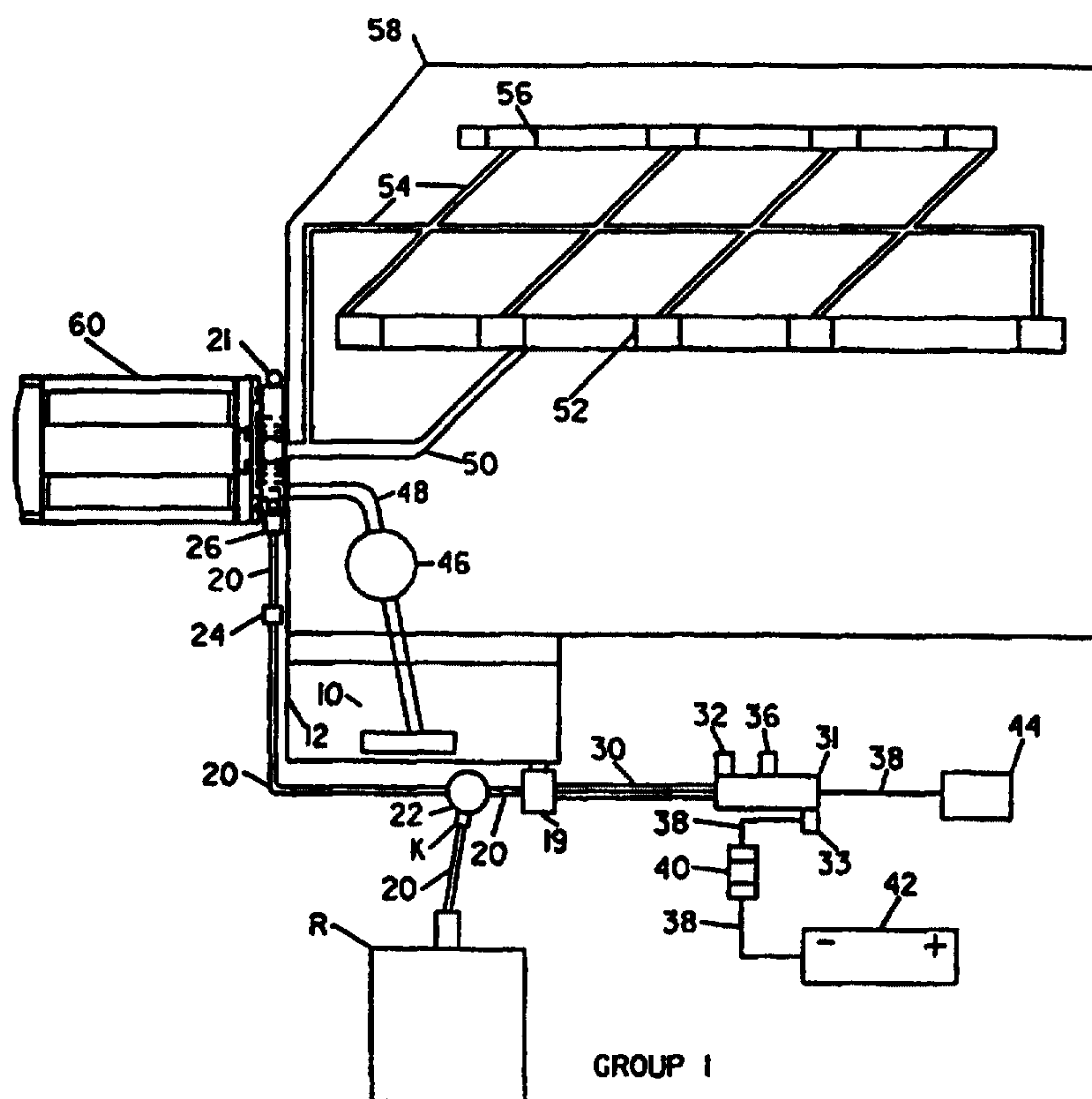
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(54) Title: PRELUBRICATION SYSTEMS AND METHOD

(57) Abstract

An apparatus for automatically preventing wear in an internal combustion engine includes an electric pump (19), a disconnect coupling (26), a high arrestance filter (60), a programmable logic control element (36), and an external controller (44). The programmable logic control element is connected to a normally provided battery (42) and automatically switches control power from the battery to the electric pump according to a programmed control operating cycle program, and is operatively independent of ignition switch activation or operator action. The inlet of the electric pump is connected to the normally provided engine oil sump (12) for removing lubricating fluid. The lubricating fluid is pumped through the high arrestance filter, yielding a substantially contaminant free lubricating fluid which after flowing through a radiator is discharged into the normally provided engine lubricating gallery (54). The external controller, such as a wireless remote control, is provided to activate the pump remotely upon demand.



PRELUBRICATION SYSTEMS AND METHOD

Background-Field of the Invention

The present invention relates to internal combustion engines, and more particularly to improvements and additional functions, to a method and apparatus for admitting a lubricating fluid into the existing lubrication system of those engines for prelubricating the engine before start-up to reduce wear on the moving parts of the engine, and the additional improvements of automatic priming, cleaning, flushing, and oil changing.

Background-Description of the Prior Art

Internal combustion engines depend for their proper lubrication to be already running. During start-up, proper lubrication is not immediately achieved since all the oil or lubricant in the normally provided engine oil galleries is evacuated by gravity action. After the elapsing of a period of time, the oil adhered to the slidable working surfaces, engine lubricating galleries, and parts, drains to the bottom reservoir or oil sump. This leaves the slidable working surfaces unprotected from wear during the next start-up. McDonnell Douglas has performed tests which indicate that up to 90 percent of the wear in an internal combustion engine occurs during such start-ups or dry-starts due to oil starvation. Other wear mechanisms account for substantial wear in engines. These wear mechanisms are attributed mainly to suspended solid particles and chemical contaminants in the lubricating oil.

Most prior art systems addressing this problem rely on activation immediately prior to and/or during starting of the internal combustion engine. These methods introduce inconveniences such as waiting for the operating cycle to occur, required operator action, and difficult installation. Such inconvenient time delay is irritating to the vehicle operator and in some prior art may even be dangerous should the vehicle stall and needs to re-start immediately. There still is the long-felt need to have a system that delivers the desired benefits without irritating waiting time, and easily

installed. In addition, prior art does little to address the added benefits of removing solid and chemical contaminants from the lubricating oil in combination with their prelubricating functions, and the benefits of substantially reducing the time required to reach normal oil pressure immediately after start-up as a result of the present invention automatic priming and anti-backflow function. Introduction of a filter rated for much higher arrestance for suspended solids with the additional function of separating chemicals from the oil and cooperating with the present invention solves an additional wear problem not addressed in prior art. In addition, due to a new operating strategy the installation of the device is greatly facilitated due to the inherent reduction of size and energy requirements, not inherently available in prior art.

Prior art devices are required to be larger and more complicated installations because they need to overcome the specification of quick on demand delivery of lubricating oil. The present invention suggests and discloses a method and apparatus with an automatic system which substantially delivers the expected benefits, with the unexpected result of no waiting time and inherent reduction in size and cost. The present invention solves the problem of installation by providing for an anti-backflow adapter plate, a drainplug pump head adapter, and means to remotely transfer mechanical power to the pump head adapter.

Some prior art depend for their performance on a compressed chamber of potentially flammable liquid inside a hot engine bay. Rupture of the holding chamber inside a hot engine bay will produce a fire and environmental hazard. For example, a preoiling system depicted in U.S. Pat. No. 2,736,307, which issued to Wilcox on Feb. 1956, includes a high pressure pump for charging a reservoir with engine oil which is released by engagement of the starter switch. Another type of lubricating system, depicted in U.S. Pat. Nos. 2,755,787 and 3,422,807, releases oil from a reservoir as the ignition is activated. A preoiler with a solenoid valve is shown in U.S. Pat. No. 3,556,070 and U.S. Pat. No. 3,583,525. A valve arrangement, depicted in U.S. Pat. No. 3,583,527, which issued to Raichel on Jun. 1971, controls the charge and discharge of a reservoir of oil under pressure in response to the closing of the ignition switch. Another engine preoiler, disclosed in U.S. Pat. No. 4,061,204, includes a valve arrangement in the base of an accumulator having multiple ports. U.S. Pat. No. 4,094,293 depicts an engine pre-oiler with a pressurized reservoir for containing engine oil. Yet another prelubrication device depicted in U.S. Pat. No. 4,112,910, shows a holding mechanism for a coiled power spring which is released on actuation of the ignition system whereupon oil in a chamber is evacuated. U.S. Pat. No. 4,359,140, which issued to J. Shreve on Nov. 16, 1982, discloses an auxiliary engine oiler including a reservoir for storing a lubricant under pressure. Another approach is U.S. Pat. 5,156,120, which issued to Kent on Oct. 20, 1992, discloses a system with an accumulator for holding lubricant under pressure and returning the lubricant upon engine start-up. Yet another prelubrication system, depicted in U.S. Pat. No. 4,703,727, which issued to Cannon on Nov. 1987, shows a high

pressure oil pump, controlled by an ignition switch and an oil pressure sensor, for supplying oil to an engine immediately prior to start-up. These systems introduce inconvenience, safety and potential environmental problems.

Another approach is to provide a prelubrication system such as those disclosed in U.S. Pat. Nos. 3,066,664, which issued to McNew et al. on Dec. 1962; 3,722,623, Waldecker; 3,842,937, Lippay et al.; 4,157,744, Capriotti; 4,168,693, Harrison; 4,524,734, Miller; 4,502,431, Lulich; 4,834,039, Apostolides; 4,825,826, Andres; 4,875,551, Lulich; 4,893,598, Stasiuk; 4,936,272, Whitmore; 4,940,114, Albrecht; and 5,000,143, which issued to Brown on Mar. 1991. Generally, these patents disclose supplementary oil pumping systems which inject oil into the engine immediately prior to cranking and/or start-up. Although these references partially address the problem of prelubricating the engine, there are many undesirable design drawbacks and unrecognized problems to such systems. Additional elements in prior art increase the complexity and costs of installation and maintenance of such systems, as well as the space requirements in an already cramped engine bay. Some have required original fabrication of at least some of its components. Consequently, the size, complexity, cost and problems associated with the installation and maintenance of such systems has prevented their widespread use in most vehicles. It is estimated that less than approximately 1 in 10,000 automobiles have an engine prelubrication system.

Another approach is U.S. Pat. No. 4,199,950, which issued to A. Hakanson et al. on April. 29, 1980, which discloses a system for prelubricating an engine during starting in the form of an atomized mist generated by a nozzle operating under high pressure conditions. U.S. Pat. No. 4,502,431, which issued to J. Lulich on Mar. 5, 1985, discloses an oil pumping system driven from the starter motor which generates oil pressure prior to start-up.

Another approach is U.S. Pat. No. 5,195,476, which issued to Schwarz on Mar. 23, 1993, discloses a system for prelubricating an engine by using the pump provided by the manufacturer as a means to pressurize the oil immediately before start-up, but at the expense of introducing undesirable wear and tear on the starting and electrical system, and inconvenience. U.S. Pat. 5,121,720, which issued to Roberts on June 1992, discloses a prelubrication system that operates upon the operator opening the door, with the problem of inconvenience, and unnecessary wear and tear of the apparatus due to false open door signals.

Yet another approach is found in U.S. Pat. 5,488,935 issued to R. L. Berry Jr. on Feb. 6, 1996, which discloses a single charge pressurized oil injection system comprising a pressure accumulator and a normally closed electromagnetic valve operated when the ignition switch is turned to the on position. Other relatively unsafe hydraulic accumulators have been provided in prior art which

could be applied in the field of invention. For example, U.S. Pat 2,300,722 to Adams et al. which issued on Nov. 1942; U.S. Pat 2,394,401 to Overbeke; U.S. Pat 2,397,796 to Lippincott; U.S. Pat 4,769,989 to Oswald et al.; U.S. Pat 5,197,787 to Matsuda et al.; and U.S. Pat 5,494,013 to Helbig, which issued on Feb. 1996, are illustrative of such prior art.

One recent approach to this problem is to introduce into the engine oil chemical additives which cling to the walls of the cylinders and other movable parts after the engine is shut off. These additives have questionable effectiveness and permanency, since their effectiveness is extremely difficult, if not impossible, to ascertain or verify. In addition, booster doses are needed periodically due to degradation and oil changes. However, the present invention cooperates and enhances whatever possible benefits of this approach by automatically and periodically delivering the treated oil to the required working surfaces.

Each of the noted patents deals with the dry-start problem in either an incomplete or ineffective manner, unsafe, potentially dangerous by way of holding pressurized combustible material inside a hot engine bay; or by way of complex, energy intensive, and costly apparatus due to real time on demand immediately prior to start-up requirements. Therefore, most prior art prelubrication systems supply oil to the engine parts, immediately prior to ignition and while the operator waits for the cycle to occur, introducing various undesirable and costly design trade-offs, and high levels of inconvenience to the user operator. More specifically, the mutually exclusive design requirements of reducing the cycle time prior to start-up at the expense of increased pump size, energy demands, and volumetric capacity. In other words, a pump or reservoir under pressure is unable to deliver the desired prelubricating functions instantaneously or in zero time. Therefore, the foregoing prior art references operating strategies are inherently inconvenient, or in the case of chemicals, hard to verify their effectiveness.

Accordingly, there has continued to be a need for a prelubricator which is effective, simple, inexpensive to manufacture and operate, which is easy to install in an existing engine without major modifications to the engine assembly. A prelubricator which automatically prelubricates the engine, and in addition to that process it automatically reduces the time to achieve normal oil pressure upon start-up, changes oil, flushes coked oil deposits from oil galleries, extends oil life by removing solid and chemical contaminants from the lubricating oil. A prelubrication system which enjoys favorable design trade-offs due to its method of operation with benefits related to its inherent substantial reduction of hardware size which allows for installation advantages not available to prior art. A system which is easily adapted to automobile production lines as an internal part of the engine due to its inherent size. A system which is safe to operate in a confined high temperature engine bay. A system that delivers the desired results automatically, by including unsuggested modifications in prior art. And more specifically, a system which performs

its programmed operation without having the user wait a single moment immediately prior and independent of engine start-up or ignition switch, resulting in a system which delivers the highest possible convenience to its user operator.

Summary of the Invention of Group 1

The present invention solves the problems encountered in prior art with a prelubricating system which is automatic, independent of startup occurrence, convenient, largely ignored by the engine operator, and most easily installed. The system includes a drain plug adapter pump head which replaces the normally provided oil drain plug. Due to lack of space around the drain plug area coupled with limited ground clearance in vehicles, it is desirable to have an adapter that is small and convenient to install without any modifications. These space limitations and structural conflicts also make a small and easy-to-install adapter desirable in many motoring devices including, but not limited to boats, motorcycles, airplanes or any mechanical device needing mechanical lubrication. Prior art requiring large pump heads can not fulfill these mutually exclusive requirements due to a simple physical conflict arising from their traditional operating strategy: the time required to deliver prelubrication immediately prior to start-up increases as pump head decreases. It has not been apparent until now, that a new operating strategy allows for the introduction of a drain plug pump head adapter operating in cooperation with an anti-backflow adapter plate combination because the operating strategy delivers the benefits independent of the operator and therefore delivery time is no longer of any consequence.

Prior art prelubricating systems only prelubricate. This invention on the other hand, teaches a drain plug pump head adapter system cooperating with an anti-backflow adapter, an operating strategy, a high efficiency in line filter, and a three-way keyed oil change adapter exhibits synergy and solves many undesirable problems which exist in prior art, for example the present invention includes at least 18 benefits, the system:

1. minimizes pump delivery requirements and operating time and the implications of pump head size reduction and ease of installation;
2. allows for remote installation of a prime mover to further reduce clutter, mass and allows for ease of installation around the drain plug point of attachment;
3. eliminates complicated installations by requiring only two easy to locate normally provided hydraulic points of connection and two electrical points of connection;
4. allows lower manufacturing and materials cost of installation by requiring substantially smaller production hardware requirements and easy installation charges;
5. maintains substantially at all times the engine lubricating galleries primed and sliding surfaces lubricated to prevent wear;

6. minimizes system operating time and energy requirements by including an oil filter anti-backflow adapter plate which routes oil to protected areas and prevents undesirable oil seepage through the normally provided engine oil pump mechanical clearances;
7. filters the incoming oil before injection to the engine galleries since it must flow first through the normally provided filter;
8. extends oil life automatically by reducing friction produced solid contaminants and byproducts;
9. enhances engine health and long-term performance by periodically flushing engine galleries of coked oil clogging deposits resulting from post-shutdown residual heat;
10. removes engine life-robbing solid and chemical contaminants from the oil if system when equipped with a high efficiency arrestance filter;
11. eliminates the need to have a self-priming pump since the drain plug is the pump;
12. eliminates loss of head or intake pressure since the intake is immediately next to the fluid to be pumped;
13. eliminates first intake conduit requirement found in prior art from the oil sump to the pump;
14. reduces damage and protects the environment where oil changes are only possible by accessing a keyed three-way valve connected to a provided system reservoir where used oil is exclusively collected for proper disposal or recycling;
15. reduces the time for an oil change to the replacement of the oil filter and oil refilling by including an automatic oil change feature;
16. eliminates modifications to adapt to an engine by replacing the drain plug;
17. eliminates the irritating prior art teaching which operate the device immediately prior to or during start-up and sometimes unsafe waiting operating time of all referenced prior art;
18. reduces electric risk by disposing the fuse at the most upstream point next to the power source at point of connection as opposed to connected to an ignition switch or dash mounted switch as in the prior art;
19. reduces the size of hydraulic components since there are no time constraints on flow rates of the viscous fluid; and
20. reduces substantially the time to achieve normal operating pressure upon start-up at any time.

The lubricating oil is pressurized by the drain plug adapter into the normally provided lubricating gallery of an internal combustion engine. Since the problem of dry startup is caused by the absence of oil after a suitable amount of time due to gravity action, the pressure device or pump is operated by an electronic controller, which controls the pressure raising device or pump to deliver an amount of lubricating oil to the lubricating galleries of the engine. Therefore, this keeps internal moving parts impregnated and substantially protected with lubricant to substantially reduced wear during the following or next startup cycle, and the engine galleries substantially primed with oil to greatly reduced the time to reach normal operating oil pressure upon startup. This operating cycle time is shorter than the time required for gravity to fully evacuate the lubricating galleries and internal moving metallic surfaces.

The mechanisms of wear in an engine are caused by the absence of oil from wear intensive surfaces during start-up, the time required to achieve normal operating pressure immediately after start-up, abrasion during engine operation caused by solid contaminants suspended in the lubricating oil, and chemical contaminants in the lubricating oil which attack metallic surfaces and degrades the protecting lubricating properties of the lubricant.

The drain plug pump head adapter of the present invention is actuated for a predetermined duration of time by a solid state timing control device, solid state controller, programmable digital logic controller, adaptive controller, or electronic controller which automatically switches control power from the normally provided battery to the drain plug adapter pump according to an operating cycle. The adapter pump removes contaminated oil from the oil sump and delivers substantially purified lubricating fluid to the lubricating galleries in the engine. After the elapsing of a predetermined period of time, the cycle is repeated automatically. In another embodiment, the adapter pump head is actuated according to signals received from sending units and preprogrammed system characteristics. These sending units relay the status of the previous prelubricating functions and may include ambient temperature, engine temperature, level of oil contamination, elapsed time from last operation, real time residual lubrication level, time of day, among others. Preprogrammed system characteristics may include size of engine, number of cylinders, geographic region of operation, diesel or gas, and even driver profile or expected vehicle operating duty. Therefore, this fixed periodic action or real time variable action keeps internal moving parts substantially prelubricated at all times with purified lubricating oil prior to any start-up cycle, keeps the engine galleries substantially primed or filled up to reduce the time required to reach normal oil pressure, flushes galleries of residual oil coking from post-shutdown residual heat, and removes solid particles suspended in the lubricating oil, and removes the chemical contaminants from the lubricating oil.

Summary of the Invention of Group 2

The present invention solves the problems encountered in prior art with a method and apparatus which in addition to its automatic prelubricating function delivers automatic priming, automatic purification of the lubricating oil, independence from engine start-up or ignition switch, ease of installation, and convenience in its operation. The system includes a programmable control element which periodically controls a pump having its inlet connected to a suitable point where a lubricating oil is normally located in an engine. The lubricating oil is pressurized and discharged by the pump through a commercially available high arrestance filter for the removal of solid and chemical contaminants in the lubricating oil. The system

discharges the oil into the normally provided lubricating gallery of an internal combustion engine.

The mechanisms of wear in an engine are caused by the absence of oil from wear intensive surfaces during start-up, the time required to fill up the oil supply system and engine galleries immediately after start-up, abrasion during running caused by solid contaminants suspended in the lubricating oil, and chemical contaminants in the lubricating oil which attack metallic surfaces and degrades the lubricating properties of the lubricating oil. The pump of the present invention is actuated for a predetermined duration by a solid state timing control device, solid state controller, programmable digital logic controller, or electronic controller which automatically switches control power from the normally provided battery to the pump. The pump removes contaminated oil from the oil sump and delivers substantially purified lubricating fluid to the lubricating galleries in the engine. After the elapsing of a predetermined period of time, the cycle is repeated. Therefore, this periodic action keeps internal moving parts substantially prelubricated at all times with purified lubricating oil prior to the next start-up cycle, keeps the engine galleries substantially primed or filled up to reduce the time required to reach normal oil pressure, removes solid particles suspended in the lubricating oil, and removes the chemical contaminants from the lubricating oil.

Summary of the Invention of Group 3

The present invention solves the problems encountered in prior art with a method and apparatus which in addition to its automatic prelubricating function delivers the duties of filtration, automatic priming, independence from engine start-up or ignition switch, ease of installation, and convenience in its operation. The system includes a programmable control element which periodically controls the present invention which has its inlet connected to a suitable point where a lubricating oil is normally located in an engine. The lubricating oil is pressurized and discharged by the oil filter pump into the normally provided lubricating gallery of an internal combustion engine.

The mechanisms of wear in an engine are mostly caused by the absence of oil from wear intensive surfaces during start-up and the time required to fill up the oil supply system and engine galleries immediately after start-up. The oil filter pump of the present invention is actuated for a predetermined duration by a solid state timing control device, solid state controller, programmable digital logic controller, or electronic controller which automatically switches control power from the normally provided battery to the pump or pump driver. The pump removes oil from the oil sump and delivers the lubricating fluid to the lubricating galleries in the engine. After the elapsing of a predetermined period of time, the cycle is

repeated. Therefore, this periodic action keeps internal moving parts substantially prelubricated at all times with lubricating oil prior to the next start-up cycle and keeps the engine galleries substantially primed or filled up to reduce the time required to reach normal oil pressure.

Summary of the Invention of Group 4

The present invention solves the problems encountered in prior art arrangements with a lubricating system which is automatic, independent of startup time or occurrence, convenient and largely ignored by the engine operator. The system includes a pressure raising device having its inlet connected to a suitable point where a lubricating fluid is located, or immersed in the fluid to be pumped, or inside the engine to be protected. The lubricating oil is then pressurized by a pressure raising fluid delivery device or pump into the normally provided lubricating gallery of an internal combustion engine. Since the problem of dry startup is caused by the absence of oil after a suitable amount of time due to gravity action, the pressure device or pump is operated by an electronic controller, which controls the pressure raising device or pump to deliver an amount of lubricating oil to the lubricating galleries of the engine. Therefore, this keeps internal moving parts impregnated and substantially protected with lubricating oil to substantially reduced wear during the following or next startup cycle, and the engine galleries substantially primed with oil to greatly reduced the time to reach normal operating oil pressure upon startup. This operating cycle time is smaller than the time required for gravity to fully evacuate the lubricating galleries and internal moving metallic surfaces.

The mechanisms of wear in an engine are caused by the absence of oil from wear intensive surfaces during start-up, the time required to achieve normal operating pressure immediately after start-up, abrasion during engine operation caused by solid contaminants suspended in the lubricating oil, and chemical contaminants in the lubricating oil which attack metallic surfaces and degrades the protecting lubricating properties of the lubricating oil. The pump of the present invention is actuated for a predetermined duration by a solid state timing control device, solid state controller, programmable digital logic controller, adaptive controller, or electronic controller which automatically switches control power from the normally provided battery to the pump according to an operating cycle. The pump removes contaminated oil from the oil sump and delivers substantially purified lubricating fluid to the lubricating galleries in the engine. After the elapsing of a predetermined period of time, the cycle is repeated automatically. Therefore, this periodic action keeps internal moving parts substantially prelubricated at all times with purified lubricating oil prior to the next start-up cycle, keeps the engine galleries substantially primed or filled up to reduce the time required to reach normal oil pressure, flushes galleries of residual oil

coking from post-shutdown residual heat, and removes solid particles suspended in the lubricating oil, and removes the chemical contaminants from the lubricating oil.

Objects and Advantages

Accordingly, there exists a need for an engine prelubrication system which will reduce engine wear and will be simpler, less expensive, more space efficient, and more easily installed and maintained in existing and as an easily installed engine part in an automobile assembly line instead of prior art which has only a single function.

It is therefore, a primary object of the present invention to provide a prelubrication system that, is automatic and independent of engine start-up or ignition switch activation, which includes unappreciated advantages and unsuggested modifications in prior art, that has all the advantages and many additional benefits from the function of priming, and has none of the unrecognized problems and undesirable design shortcomings found in prior art.

An additional object of the present invention is to provide an engine prelubrication system, that includes previously unsuggested modifications which automatically and simultaneously removes contaminants and suspended wear causing particles from the lubricating oil, that automatically primes the internal engine lubricating galleries with substantially purified lubricating oil, and that automatically prelubricates the engine wear surfaces with substantially purified lubricating oil at all times.

A further object of the present invention is to provide an engine prelubrication system, that is automatic and does not require ignition switch activation or engine operator action immediately before start-up for its operation, in order to overcome the unrecognized problem of waiting and unsafe operation found in prior art.

An additional object of the present invention is to provide an engine prelubrication system, that includes a commercially available solid state timing control device, programmable controller, or adaptive control element which stores or adapts an optimized pre-programmed operating strategy to maximize convenience, wear prevention functions, and to minimize system activation to increase the longevity of the system.

Yet another object of the present invention is to provide an engine prelubrication system, that is compact, modularly designed and manufactured from commercially available components, as a result of favorable design trade-offs.

A further object of the present invention is to provide an engine prelubrication system, that solves the unrecognized problems of installation and unfavorable design shortcomings related to single function, inherent larger size, larger energy demands, oil volume variations, and added hardware of prior art by including the unsuggested combination of an anti-backflow adapter plate, a drain plug pump head adapter, a high efficiency filter, and an electronic controller.

A still further object of the present invention is to provide an engine prelubrication system, that has favorable design advantages and synergies, and therefore reduces cost of manufacture with regard to both material and labor, and which accordingly has the advantage of low price of both sale and installation to the consuming public, thereby making such engine wear reduction system economically available to the general buying.

Yet another object of the present invention is to provide an engine prelubrication system, that is more environmentally responsible when compared to prior art, that utilizes a keyed three-way hydraulic valve which allows an oil change only if a system provided recycling reservoir is connected.

A further object of the present invention is to provide an engine prelubrication system, that is a more easily installed engine part in an assembly line due to the unexpected results of its operating strategy and the resulting previously unappreciated advantage of its inherently smaller number of parts, readily accessible connection points, and physical size than prior art prelubrication systems.

Yet another object of the present invention is to provide an engine prelubrication system, that has smaller operating periods of time and therefore lower energy requirements, by its oil filter anti-backflow adapter which routes injected oil towards the desired surfaces and prevent flow through the normally provided engine pump as is the practice in prior art.

Another object of the present invention is to provide an engine prelubrication system, that requires for electrical connection only one pair of wire means, which does not require connection to the ignition switch or other dash installed switch, and that leads to a more easily installed and safer device.

Yet another object of the present invention is to provide an engine prelubrication system, that is a more compact and easily installed accessory in all motors current and older due to its inherently smaller number of parts, dual use connection points, and physical size than prior art prelubrication systems.

Another object of the present invention is to provide an engine prelubrication system, that has the advantage of its periodic operating strategy which allows for automatic removal of used motor oil from the engine to reduce the time for an oil change.

A still further object of the present invention is to provide an engine prelubrication system, that automatically primes and flushes oil residues from post shut-down residual heat oil coking from the walls of the internal lubricating galleries of said engine with substantially purified lubricating oil to reduce wear by substantially reducing the time required by the engine to reach normal pressure immediately after start-up due to priming and keep them clog-free over the long-term due to flushing.

Yet another object of the present invention is to provide an engine prelubrication system, that is easily available to the buying public and through its adoption on a large scale will contribute to the enhancement of the environment by making engines run more efficiently, facilitating the capture and recycling of used motor oil, avoiding waste of national resources, and deferring the use of natural resources.

Further objects of the invention will appear as the description proceeds and claims drawn. To the accomplishment of the above and related objects, this invention may be embodied in the form illustrated in the accompanying drawings, attention being called to the fact, however, that the drawings are illustrative only, and that changes may be made in the specific construction illustrated and described within the scope of the appended claims.

Brief Description of the Drawings

The present invention will be more fully understood by reference to the following detailed description thereof when read in conjunction with the attached drawings, in which like reference characters designate the same or similar parts only in the referred group of embodiments and not throughout the four groups, wherein:

Drawings of Group 1

FIG. 1 is a detail side view illustrating the components of the engine prelubrication system according to a first embodiment in the group of the present invention.

FIG. 2 is a side view illustrating the components of one possible physical arrangement for the oil drain plug pump head showing a gear pump.

FIG. 3 is a side view and top view illustrating the anti-backflow adapter plate.

Drawings of Group 2

FIG. 1 is a detail side view illustrating the components of the engine wear prevention system according to a first embodiment of the present invention installed on a conventional engine block.

FIG. 1A is a diagrammatic view illustrating and further clarifying the block diagram connection of electric components shown in FIG. 1 according to an example mode.

FIG. 2A is a longitudinal cross sectional view of a tee hydraulic connector means, or a three-way hydraulic coupling of the present invention which provides for passage of lubricating oil between the wear prevention system and the engine gallery.

FIG. 2B is a transverse cross sectional view of the tee hydraulic connector means, or three-way hydraulic coupling of the present invention which provides passage of lubricating oil between the engine wear prevention system and the engine gallery.

FIG. 3 is a side view illustrating diagrammatically the engine wear prevention system in an engine according to a second and preferred embodiment of the present invention with the programmable control element circuitry contained within the pump enclosure installed on a conventional engine block.

FIG. 4 is a side detail view illustrating the manner of attachment of the preferred embodiment showing the point of installation to the normally provided oil sump, and a detail side view illustrating the engine wear prevention system according to a third embodiment with the programmable control element circuitry contained within the pump enclosure installed on a conventional engine block.

FIG. 5 is a side view diagrammatically illustrating the engine wear prevention system according to a fourth embodiment of the present invention installed on a conventional engine block.

FIG. 6 illustrates a detail side view of the engine wear prevention system of the present invention according to a fourth embodiment including a hollow dipstick for oil intake into the system.

FIG. 7 is a sectional drawing illustrating the engine wear prevention system of the present invention according to a fifth embodiment which replaces the normally provided oil filter normally provided on a typical engine.

Drawings of Group 3

FIG. 1 is a sectional view of a preferred embodiment of the oil filter pump of the present invention.

FIG. 2 is a schematic representation of the preferred embodiment with all auxiliary components and connected to a typical internal combustion engine.

FIG. 3 is a sectional view of a second embodiment showing a conventional oil filter fitted with an oil filter pump adapter kit assembly of the present invention.

FIG. 4 is a schematic representation of the second embodiment with all necessary auxiliary components and connected to a typical internal combustion engine.

FIG. 5 is a sectional view of a third embodiment showing an electromagnetic mechanical coupling.

Drawings of Group 4

FIG. 1 is a detail side view illustrating the components of the engine wear reduction system according to a first embodiment of the present invention installed inside the oil pan of a conventional engine and internally connected to the oil gallery of a typical engine block.

FIG. 2 is a side view illustrating diagrammatically the engine wear prevention system in an engine according to a second embodiment of the present invention with the programmable control element circuitry contained within the pump enclosure.

FIG. 3 is a side view illustrating the engine wear reduction system installed immediately next to the oil pan of a typical internal combustion engine, and equipped with a remotely located controller and connected to the oil gallery of a typical engine block through a "tee" hydraulic connector.

FIG. 4 is a side view diagrammatically illustrating the engine wear reduction system according to a fourth embodiment, showing my invention installed and externally connected to the oil gallery of a typical engine block through a "tee" hydraulic connector.

FIG. 5A is an schematic view of a typical internal combustion engine, showing my invention installed into and externally connected to the engine by means of an oil filter adapter to allow discharge of the lubricating fluid or oil inside the oil filter lubricating circuit.

FIG. 5B is a side and top view of assembly adapter that facilitates installation of the embodiment shown in FIG. 5A and keeps engine lubricating galleries and system substantially primed.

Reference Numerals in Drawings of Group 1

- 10. Lubricating oil
- 12. Oil sump
- 14. Pump head threaded connector
- 15. Drain plug adapter pump head chamber
- 16. Driven pump gear
- 16A. Slave pump gear
- 17. Driven pump gear shaft key
- 18. Pump head connector
- 19. Oil drain plug pump head adapter
- 20. Hydraulic line
- 21. Anti-backflow adapter plate relief valve
- 22. Keyed three way hydraulic valve
- 24. High efficiency solid and chemical filter
- 26. Anti-backflow adapter plate
- 27. Hydraulic coupling
- 28. Hydraulic check valve
- 30. Power transmission means
- 31. Prime mover means
- 32. Duration control means
- 34. Frequency control means
- 36. Controller
- 38. Standard wire means
- 40. Fuse
- 42. Battery
- 44. Remote controller
- 46. Internal oil pump
- 48. Internal oil pump discharge gallery
- 50. Engine main lubricating gallery
- 52. Crankshaft area bearings
- 54. Engine lubricating galleries
- 56. Camshaft area bearings

- 58. Internal combustion engine
- 60. Oil filter

Reference Numerals in Drawings of Group 2

- 10. Lubricating oil
- 12. Oil sump
- 14. Modified drain plug
- 16. Check valve
- 18. Electric pump
- 20. Programmable control element
- 22. Means or Duration control knob
- 24. Means or Frequency control knob
- 26. Local control switch
- 28. Battery
- 30. Standard wire means
- 32. Conduit
- 34. Disconnect coupling
- 36. Hydraulic connector
- 38. High arrestance filter
- 40. Standard wire means for remote operation
- 42. External controller
- 44. Internal lubricating pump
- 46. Three-way hydraulic coupling
- 48. Dipstick well
- 50. Crankshaft relative motion metallic surfaces
- 52. Camshaft relative motion metallic surfaces
- 54. Engine lubricating gallery
- 56. Internal combustion engine
- 58. Bypass check valve
- 60. Low ampacity fuse
- 64. Temperature sending unit
- 66. Radiator
- 68. Electric auxiliary fan
- 70. Hollow dipstick assembly
- 72. Transverse oil filter cartridge
- 74. Assembly case
- 76. Assembly adapter
- 78. Diaphragm electric pump
- 80. Pump assembly
- 82. Electrical connector
- 84. Outlet chamber
- 86. Inlet check valve
- 88. Outlet check valve
- 90. Pump working chamber

Reference Numerals in Drawings of Group 3

10. Oil filter gasket.
12. Oil filter pump base plate
14. Oil filter pump inlet orifices
16. Oil filter threaded outlet orifice
18. Inlet oil filter pump check valve membrane
19. Inlet chamber
20. Bottom base support plate
21. Connecting orifices
22. Inner wall of filter element
23. Oil filter pump check valve biasing springs
24. Seal gasket
25. Oil filtering element locking blocks
26. Upper support plate
27. Orifice
28. Oil filter pump flexible diaphragm membrane
29. Pressure working chamber
30. Oil filter pump mechanical interface
32. Upper oil filter pump wall
34. Circular seal gasket
36. Oil filter sidewalls
38. Filtering medium or element
40. Oil filter pump outlet orifices
42. Oil filter pump outlet check valve membrane
44. Air pressure chamber
46. Oil filter pump cavity
48. Oil filter pump pressure chamber
49. Oil filter pump working chamber
50. Lubricating fluid
52. Engine oil pan or oil sump
53. Internal lubricating pump
54. Drain Plug
56. Engine oil pump pickup tube
58. Oil outlet tube
60. Engine block oil filter mating surface
62. Oil filter pump
65. Electromagnetic coil
66. Control wiring
68. Electronic controller
70. Duration control knob
72. Frequency control knob
74. Local control switch
75. Fusible link
76. Electric wire
77. Oil filter
78. Battery
79. Oil filter wall

- 80. Control wire for remote operation
- 82. Remote operator
- 84. Oil filter outlet pipe
- 86. Internal combustion engine
- 88. Engine lubricating galleries
- 90. Crankshaft relative motion metallic surfaces
- 92. Camshaft and valve train relative motion metallic surfaces
- 94. Hydraulic check valve
- 96. Modified drain plug
- 98. Hydraulic line or hose
- 100. Hydraulic disconnect coupling
- 101. Hydraulic coupling
- 108. Cable or actuating rod sheath
- 112. Mechanical coupler or threaded connector
- 114. Flexible membrane
- 116. Oil filter pump adapter seal kit
- 118. Oil filter pump adapter wall seal
- 120. Assembly adapter
- 124. Pressure chamber
- 126. Oil filter upper cavity
- 128. Prime mover power means or power source
- 130. Oil filter pump adapter kit sealing clamp or band
- 132. Oil filter pump adapter kit sealing band adjustment screw
- 134. Oil filter pump adapter kit housing
- 135. Oil filter pump adapter kit assembly
- 136. Reciprocating shaft
- 138. Oil filter pump connector
- 140. Oil filter pump mechanical connector
- 142. Mechanical guide or cable sheath
- 144. Eccentric attachment
- 146. Rotating wheel or pulley
- 148. Prime mover shaft
- 150. Prime mover

Reference Numerals in Drawings of Group 4

- 10. Lubricating oil
- 12. Oil sump
- 14. Engine oil pump pick-up
- 15. Hydraulic pump inlet
- 16. Oil sump adapter and installation fixture
- 17. Timed pump
- 18. Modified drain plug
- 19. Hydraulic line
- 20. Hydraulic coupling

- 21. Control wires
- 22. Hydraulic line
- 23. Hydraulic connector
- 24. Three-Way hydraulic valve
- 25. Hydraulic pump outlet
- 26. Hydraulic connector
- 27. Quick disconnect hydraulic coupling
- 28. Electric hydraulic pump
- 29. Check valve
- 30. Three-way hydraulic connector
- 31. High efficiency filter
- 32. Lubricating fluid pressure sending unit
- 34. Engine lubricating gallery
- 36. Crankshaft relative motion metallic surfaces
- 38. Camshaft and valve train relative motion metallic surfaces
- 40. Internal pump
- 42. Engine oil pump discharge tube
- 44. Lubricating gallery
- 46. Battery
- 48. Standard wire means
- 50. Fuse
- 54. Electronic controller
- 56. Duration control means or knob
- 58. Frequency control means or knob
- 60. Local control switch
- 62. Standard wire means
- 64. Internal combustion engine
- 66. Remote operator
- 68. Control wire harness for remote operations
- 70. Engine oil filter mating surface
- 72. Assembly adapter
- 74. Oil filter

Mode of operation of Group 1

The present invention prelubrication system and method is based on automatic operation made possible by the inclusion of a solid state timing control device, solid state controller, or adaptive controller operatively connected to a prime mover which in turn powers a drain plug adapter pump head. This control element switches electric control power from a normally provided battery and powers on a pump head which replaces the normally provided drain plug according to a programmed operating strategy stored in the control element. Inclusion of an electronic control element results in favorable design trade-offs and cooperating benefits in the form of simultaneous prelubricating, priming, and lubricant purifying. Additional benefits are found in the design, manufacture, simplicity, installation, safety, and convenience to the user. Furthermore, much smaller hardware size and power consumption are needed, since delivery time of the lubricating

fluid is no longer of importance to the operator, and the inclusion of an oil filter adapter anti-backflow plate reduces the pump operating time when compared to prior art. This is possible because the present invention delivers the desired results automatically, without human intervention, and into engine galleries that have been substantially filled or primed by the previous automatic system operation. Therefore, function delivery time is of no relevance, and waiting immediately before engine operation, as widely suggested in prior art, is eliminated. In addition, if it is required to operate immediately before start-up, the required time to deliver the benefits is substantially reduced.

The present invention takes advantage of the viscous properties of the lubricating oil, high viscosity gradient with respect to temperature, capillary forces, engine cool-down cycles, the small volume of oil that typical lubricating galleries require to fill-up, the oil filter anti-backflow adapter which keeps the galleries substantially filled, and the increasing time required for a viscous oil to flow from cooling surfaces typically separated by tight mechanical tolerances inside the conventional engine.

If a drain plug pump head adapter delivers a lubricating oil to overfill the engine lubricating galleries. In addition, the engine has ceased operation and therefore is cooling down resulting in an increasing lubricating oil viscosity index over time. Further, the ability of the lubricating oil to flow is also decreasing as its temperature decreases. In addition, the period between automatic pump operations is smaller than the period of time required for the lubricating oil to drain from the desired wear intensive surfaces and passages as monitored by sensors or a preprogrammed operating strategy or a combination of both. Also, an oil filter anti-backflow adapter plate prevents injected oil to flow back to the sump through the normally provided oil pump. And lastly, a high arrestance filter is introduced in series with the hydraulic pump that processes incoming dirty lubricating oil into purified and substantially analytically clean oil. Therefore, the engine will automatically and simultaneously be substantially prelubricated to avoid wear during start-up at all times, will require less electrical energy for automatic operation, will reach normal oil operating pressure sooner upon start-up, will continuously have substantially cleaner oil due to automatic filtration, and it will be extremely convenient to use by eliminating operation immediately before start-up as suggested in the prior art.

Elimination of on-demand constraints found in prior art requiring operation immediately before and/or during start-up will lead to solving the unrecognized problem of inconvenience in prior art. It will also result in very favorable and previously unappreciated advantages, and synergies in the cooperating functions of prelubricating, priming, purifying, and evacuating lubricating oil from the oil sump for the purpose of routine oil change.

Mode of operation of Group 2

The present invention method and apparatus is based on automatic operation made possible by the inclusion of a solid state timing control device, solid state controller, programmable digital logic controller operatively connected to a hydraulic electric pump. This programmable control element switches electric control power from a normally provided battery to an electric pump according to a programmed operating strategy. Inclusion of an electronic programmable control element leads to favorable design trade-offs and cooperating benefits in the form of simultaneous prelubricating, priming, and lubricant purifying. Additional benefits are found in the design, manufacture, simplicity, installation, safety, and convenience to the user. Furthermore, much smaller hardware size and power consumption is needed, since delivery time of the lubricating fluid is no longer of importance to the operator. This is possible because the present invention delivers the desired results automatically without human intervention. Therefore, function delivery time is of no relevance, and waiting immediately before engine operation as widely suggested in prior art is eliminated.

The present invention takes advantage of the viscous properties of the lubricating oil, high viscosity gradient with respect to temperature, capillary forces, engine cool-down cycles, the small volume of oil that typical lubricating galleries require to fill-up, and the increasing time required for a viscous oil to flow from cooling surfaces typically separated by tight mechanical tolerances inside the conventional engine.

If a commercially available electric hydraulic pump delivers a lubricating oil to overfill the engine lubricating galleries. In addition, the engine has ceased operation and therefore is cooling down resulting in an increasing lubricating oil viscosity index over time. Further, the ability of the lubricating oil to flow is also decreasing as its temperature decreases. In addition, the period between automatic pump operations is smaller than the period of time required for the lubricating oil to drain from the desired wear intensive surfaces and passages. And lastly, a high arrestance filter is introduced in series with the hydraulic pump that processes incoming dirty lubricating oil into purified and substantially analytically clean oil. Therefore, the engine will automatically and simultaneously be substantially prelubricated to avoid wear during start-up, will reach normal oil operating pressure sooner upon start-up, will continuously have substantially cleaner oil due to automatic filtration, and it will be extremely convenient to use by eliminating operation immediately before start-up as suggested in the prior art.

Elimination of on-demand constraints found in prior art requiring operation immediately before and/or during start-up will lead to solving the unrecognized problem of inconvenience

in prior art. It will also result in very favorable and previously unappreciated advantages in design trade-offs, and synergies in the cooperating functions of prelubricating, priming, purifying, and evacuating lubricating oil from the oil sump for the purpose of routine oil change.

Mode of Operation of Group 3

The theory of operation of my invention resides in the independence of the prelubrication capabilities of my proposed method and apparatus with respect to on-demand requirements imposed by an operator of the internal combustion engine, immediately prior to start-up as found in prior art. Prior art addressing the problem of wear in an internal combustion engine rely on delivery of lubricating fluid immediately prior to start-up or rely on the physical properties of engine treatments in the way of oil additives of dubious permanency and efficiency. These methods require design trade-offs that lead to complex, bulky, inefficient, unsafe, inconvenient, questionable, and incomplete methods. This problem is due mainly on the on-demand time immediacy constraint, and in the case of additives to an obviously ever decreasing concentration of metallic surface additive treatment over time and oil changes. My method and apparatus is based on time independence of operation, which leads to favorable trade-offs, when compared to prior art in the field of my invention, in the design, manufacture, complexity, installation, safety, and convenience to the user. Power consumption, or pump high delivery flow rates which are proportional to hardware size, is no longer of importance since delivery time is no longer of importance to achieve the desired results. In the current art, the delivery of benefits usually requires the operator to wait until the cycle completes immediately prior to engine start-up, this introduces obvious convenience drawbacks. Such inconvenient time delay is irritating to the vehicle operator and in some prior art may even be potentially dangerous should the vehicle stall and needs to operate immediately. Installation of previous art is also complicated and hardware intensive. The present invention converts an existing and integral part of an engine operation into a dual purpose device.

It is a well known fact that upon ceasing operation, an internal combustion engine will drip oil from the lubricating galleries and relative motion surfaces by gravity action, back to the oil pan leaving these surfaces dry of lubricating fluid. After a cool down period, most lubricating fluid will be evacuated from engine working surfaces, leading to a dry-start condition upon and immediately after engine start-up. This condition has been studied by McDonnell Douglas and other experts in the field, who declared that up to 90 to 95% of engine wear occurs during this condition of engine start-up. The present invention takes advantage of the viscosity properties of the lubricating fluid, residual lubrication theory which avoids metal to metal

contact, and natural engine cool-down cycles. In addition, relatively small pump flow rates are required to deliver the small volume of oil that typical engine lubricating galleries can contain. Further, the increasing time required for a viscous fluid to drip from cooling surfaces separated by tight tolerances, because viscosity gradients with respect to temperature are steep and increasing while the engine is cooling down, favoring residual lubrication and reducing the severity of metal to metal contact upon start-up.

Upon converting the oil filter either through a redesign process or through a kit conversion, it will be able to deliver a volume of lubricating fluid sufficiently large to fill the small volume contained by the engine lubricating galleries. If in addition the engine has ceased operation and therefore is cooling down resulting in an increasing oil viscosity index over time. Further, the ability of the lubricating fluid to flow is also decreasing as its temperature decreases cooperating with residual lubrication. Furthermore, most oil will be evacuated after a period of time following engine shut-down, then the following must be true:

The engine will be prelubricated automatically to substantially avoid wear during "dry-start" conditions, and it will be convenient to the operator, when compared to prior art which works immediately before engine start-up, if the following conditions exist:

- 1) The redesigned oil filter or a conventional oil filter equipped with a kit will operate automatically during the elapsing of a first predetermined period of time to deliver a lubricating fluid volume sufficiently large to overfill the engine lubricating galleries, and
- 2) If the elapsing of a second predetermined period of time between automatic operations added to the elapsing the first predetermined period of time, defined as an operating cycle program, is smaller than the elapsed time prescribed by the experts for the previous prelubricating operation to become ineffective in avoiding substantial dry-start wear due to oil evacuating the engine galleries and the absence of residual lubrication from working surfaces, and
- 3) If the engine after shut-down engages in a cool-down period, therefore raising the viscosity index of the lubricating fluid remaining inside and in the form of residual lubrication adhering to the engine lubricating galleries, bearings, and working engine parts for longer periods of time, and
- 4) If a commonly found commercially available electronic controller is programmed to control for duration and frequency of the redesigned oil filter pump operation is introduced to operate the invention in the system,

and in addition, the apparatus continues to operate in an intermittent manner only limited by the battery or power source energy, the engine will always be found to be substantially prelubricated prior to start-up due to continued renewal of residual lubrication, and will achieve normal lubricating oil pressure sooner upon start-up. Elimination of on-demand time constraints found in prior art requiring operation immediately before and/or during start-up will lead to the highest level of convenience to the operator since the system will truly be fully automatic and largely ignored by the user. In addition it will result in very favorable design trade-offs by providing a novel use to the conventional traditional oil filter.

Mode of Operation of Group 4

The present invention method and apparatus is based on automatic operation made possible by the inclusion of a solid state timing control device, solid state controller, or adaptive controller operatively connected to a hydraulic electric pump. This control element switches electric control power from a normally provided battery and powers on an electric pump according to a programmed operating strategy stored in the control element. Inclusion of an electronic control element results in favorable design trade-offs and cooperating benefits in the form of simultaneous prelubricating, priming, and lubricant purifying. Additional benefits are found in the design, manufacture, simplicity, installation, safety, and convenience to the user. Furthermore, much smaller hardware size and power consumption are needed, since delivery time of the lubricating fluid is no longer of importance to the operator. This is possible because the present invention delivers the desired results automatically and without human intervention. Therefore, function delivery time is of no relevance, and waiting immediately before engine operation, as widely suggested in prior art, is eliminated.

The present invention takes advantage of the viscous properties of the lubricating oil, high viscosity gradient with respect to temperature, capillary forces, engine cool-down cycles, the small volume of oil that typical lubricating galleries require to fill-up, and the increasing time required for a viscous oil to flow from cooling surfaces typically separated by tight mechanical tolerances inside the conventional engine.

If a commercially available electric hydraulic pump delivers a lubricating oil to overfill the engine lubricating galleries. In addition, the engine has ceased operation and therefore is cooling down resulting in an increasing lubricating oil viscosity index over time. Further, the ability of the lubricating oil to flow is also decreasing as its temperature decreases. In addition, the period between automatic pump operations is smaller than the period of time required for the lubricating oil to drain from the desired wear intensive surfaces and passages. And lastly, a high arrestance

filter is introduced in series with the hydraulic pump that processes incoming dirty lubricating oil into purified and substantially analytically clean oil. Therefore, the engine will automatically and simultaneously be substantially prelubricated to avoid wear during start-up, will reach normal oil operating pressure sooner upon start-up, will continuously have substantially cleaner oil due to automatic filtration, and it will be extremely convenient to use by eliminating operation immediately before start-up as suggested in the prior art.

Elimination of on-demand constraints found in prior art requiring operation immediately before and/or during start-up will lead to solving the unrecognized problem of inconvenience in prior art. It will also result in very favorable and previously unappreciated advantages in design trade-offs, and synergies in the cooperating functions of prelubricating, priming, purifying, and evacuating lubricating oil from the oil sump for the purpose of routine oil change.

Detailed Description of the Drawings of Group 1

Referring to FIG. 1, it shows a schematic of a prelubrication system for an internal combustion engine 58, inside which a quantity of a lubricating fluid or oil 10 is contained within the confines of a normally provided oil sump 12. A quantity of oil 10 can be removed through a drain plug pump head adapter 19 which replaces the normally provided common oil drain plug. Referring now to FIG. 2 pump head adapter 19 is provided with a pump head threaded connector 14 which has the same thread type as the drain plug it replaces. Pump head threaded connector 14 is provided with a center channel that allows fluid communication from oil sump 12 in FIG. 1 to a drain plug adapter pump chamber 15 in FIG. 2. FIG. 2 shows a typical gear pump in which there is a driven pump gear 16 and a slave pump gear 16A. The driven pump gear 16 is equipped with a driven pump gear shaft key 17 that facilitates the transmission of mechanical power by connecting one end of a mechanical power transmission means 30 in FIG. 1 which is driven and mechanically connected to a prime mover means 31.

It is obvious that pump head adapter 19 in FIG. 1 is shown as a gear pump for simplicity, and that it can easily be any type of pump which in fact can be best described as a pressure raising fluid transfer device of any kind. Prime mover means 31 is controlled by an electronic digital controller, timer, adaptive controller, radio remote controller, sending unit outputs initiating a preprogrammed strategy in a controller, simple manual control, combination of any or all of the above, or controller 33. The simplest controller 33 is a recycling timer with fixed on and off adjustable times. Controller 33 means is coupled to the prime mover 31 for automatically switching control power from a battery 42 according to an operating cycle program, which is defined as the elapsing of an on time and thereafter the elapsing of an off time. Controller 33 powers on prime mover 31, which in turn actuates pump head 19 through transmission means 30 to pump oil 10. Increasing the level of sophistication from a recycling timer, controller 33

coupled to the sending unit outputs can be compared against the operating cycle program to modify the on and off times according to an optimizing strategy.

At the other end of complexity it would be a preprogrammed digital controller or an adaptive controller such as controller 33 being fed with information from a remote controller 44 which gathers sending unit outputs such as engine temperature, ambient temperature, engine oil temperature, coolant temperature, oil contamination, miles run since last oil change, driving habits, type of fuel, last time engine started, geographic region, contaminant moisture content, dissolved chemicals, suspended solids, blow-by residues, even a voltage sensing means to avoid full discharge of the normally provided battery 42, among others. These signals can be used to generate an optimized operating program strategy based on real time information when compared with a program with fixed parameters such as number of cylinders, type of fuel, type of oil, engine size, or even geographic region. In the limit, improvements over the simple on and off controller statistical benefits would become marginally beneficial due to cost and complexity, rendering even the simplest of systems a cost-effective alternative.

Referring to FIG. 1, it shows the controller 33 as an on and off timer for simplicity. Controller 33 has a duration control means 32 and a frequency control means 36. Power is routed from battery 42 connected to the controller 33 through a fuse 40 by a standard wire means 38. Once an operating signal is generated by controller 33, power is routed from battery 42 to the prime mover means 31 which in turn through the mechanical power transmission means 30 actuates the oil drain plug pump head adapter 19. Pump head adapter 19 pressurizes oil 10 inside the chamber 15 in FIG. 2 and out through the center channel of a pump head connector 18. Oil is routed through a hydraulic line 20 and into a keyed three-way hydraulic valve 22. The purpose of the keyed three-way hydraulic valve 22 is to serve as an interlock to the flow of oil 10 through it. Unless a keyed or interlocking adapter K, such as a mutually exclusive flow gate or a geometrically matched male-female fitting or similar, is fitted to valve 22, the user would not be able to evacuate oil 10 from oil sump 12 for the purpose of an oil change.

This simple strategy of providing as a part of the system a simple oil recycling reservoir R fitted with the interlocking adapter that serves as a key to the keyed three-way hydraulic valve 22 allows for the evacuation of oil 10 and it allows the present invention to contribute to the quality of the environment by ensuring that oil will be properly collected and enhancing the possibility of recycling the used oil by facilitating its transportation inside the conveniently provided reservoir R. The oil recycling reservoir R has one end of a conduit means 20 attached to said reservoir and the other end of conduit 20 terminated with the keyed adapter K. In addition, since the operation of pump head adapter 19 is periodic in nature and automatic, one can fit reservoir R with key fitting K and divert all of the oil 10 from oil sump automatically for an oil change very

conveniently if for instance reservoir R is left connected overnight. In the morning after, one can unhook reservoir R, and the oil change is reduced to replacement of a normally provided oil filter 60 in FIG. 1 and the refilling of oil 10.

Still referring to FIG. 1, oil 10 is routed out of three-way valve 22 through hydraulic line 20 and into a high efficiency filter 24 through which oil 10 leaves a substantial amount of solid and chemical contaminants behind according to the filter 24 design parameters. Since automatic operation of pump head adapter 19 is constant and limited only by the amount of electric energy in battery 42, oil 10 is progressively purified as the engine is not operating and due to the efficiency differences of filter 24 and the generally gross performance of filter 60. Upon exiting filter 24 the purified oil is carried through hydraulic line 20 which connects to a hydraulic coupling 27 in FIG. 3. Once oil 10 flows through coupling 27 it flows through check valve 28 and through an orifice O'. Now referring to FIG. 1, charge of oil 10 can only flow in the direction through oil filter 60 and into a main lubricating gallery 50 because it is prevented to flow back towards an internal oil pump 46 by an anti-backflow adapter plate 26. Another benefit of adapter 26 is the fact that once primed main gallery 50, and a set of a crankshaft area bearings 52, a set of a camshaft area bearings 56, and a plurality of smaller engine lubricating galleries 54, will remain substantially filled up because oil can not leave unless it flows through the surfaces to be protected. Providing anti-backflow adapter 26 prevents lubricating oil 10 discharged into main gallery 50 from seeping out. In addition, time of operation of the next period is smaller because the galleries should be substantially filled and only a small time of operation is required to push additional oil through the clearances to be protected.

Now referring to FIG. 3, adapter 26 is fitted with a plurality of orifices O disposed around a threaded section T. Orifices O allow for normal engine operating oil flow through anti back-flow adapter 26 which is fitted with a flexible membrane M which is permanently biased against orifices O and effectively serves as a check valve allowing oil flow only in the direction from the engine oil pump 46 in FIG. 1 towards the main oil gallery 50 when engine 58 operates and membrane M in FIG. 3 is pushed away from orifices O as a result of normal operating pressure. Referring to FIG. 3, when engine is not operating and pump head adapter pumps oil 10, oil 10 is only allowed to flow toward lubricating gallery 50. Threaded section T is designed to thread into the normally provided point of connection of the engine 58 and a gasket G facilitates sealing against the engine. An anti back-flow adapter plate relief valve 21 is provided to drain some of the trapped oil inside filter 60 previous to its removal by evacuating remaining oil 10 inside to flow through orifice O" and out to the ambient. Once oil 10 flows through the filter 60 it is injected into the main gallery 50 and into the smaller galleries 54 of engine 58.

Detailed Description of the Drawings of Group 2

Referring now to the drawings, Fig. 1 shows a schematic of my automatic method and apparatus for preventing wear in an internal combustion engine. As an operating part of an internal combustion engine 56 a lubricating oil 10 contained by a normally provided oil sump 12, is allowed to flow through a modified drain plug 14 connected to an intake conduit 32a. Modified drain plug 14 has a center channel to allow lubricating oil to flow from oil sump 12 to conduit 32a. Intake conduit 32a is connected to an inlet of an electric pump 18. Electric pump 18 outlet is connected to an outlet conduit 32b. Outlet conduit 32b is connected to a male-female quick disconnect self-sealing coupling, or a disconnect coupling 34. The complementary part of disconnect coupling 34 is connected to a filter intake conduit 32c.

Electric pump 18 is controlled by a commercially available solid state timing control device, solid state controller, programmable digital logic controller, or a programmable control element 20. Programmable control element 20 can be adjusted to automatically control operation of electric pump 18 in terms of duration, and frequency or period of operation. Programmable control element 20 is well known and is commercially available in customized form from many manufacturers. Programmable control element 20 draws power for its operation and switches control power to electric pump 18 from a normally provided automotive battery 28. Duration means or a duration control knob 22 and frequency means or a frequency control knob 24 allow for controlling electric pump 18 operating duration, and frequency or period of operation. These operating parameters are related to engine size, frequency of engine operation, ambient temperature, driving habits, operating time, oil change interval, among others. In the case of a programmable controller, the predetermined parameters can be evaluated to produce a combination of frequency and duration of operation that optimizes the automatic method. Such strategy stored in read-only memory in such well known programmable controllers offers improved performance over a simple recycling timer. An even further refinement can be obtained from a commercially available adaptive controller which learns by continually modifying the settings for frequency and duration.

Still referring to Fig. 1, programmable control element 20 can be an on-off recycling timer such as the American Control Products model number 846J equipped with independently set duration control knob 22 and frequency control knob 24. This timer is capable of a multitude of combinations within a range continuum to satisfy a multitude of operating conditions. As an adaptive controller, programmable control element 20 can optimize its function by learning operating conditions of internal combustion engine 56. These solid state controllers continually optimize and adjust frequency and duration of operation of pump 18 when compared to a predetermined ideal mode of operation. A local control switch 26 is also provided to override control element 20 to perform on demand operation of electric pump 18.

This is done for the purpose of evacuating lubricating oil 10 from oil sump 12 for an oil change after manually disconnecting disconnect coupling 34.

Programmable control element 20 switches control power from battery 28 by standard wire means 30b in series with a low ampacity fuse 60 for electric overload protection. Programmable control element 20 is also connected through standard wire means 40 to a remote operator, or an external controller 42. External controller 42 can be, among others, a commercially available wireless remote control, such as Accele Electronics Two Channel Keyless Remote model RS-650. For example, this external controller can momentarily de-energize control element 20, in the case of timer 846J, for approximately 2 seconds. Upon re-application of power, control element 20 resets for an "on time first" operation, rendering the present invention superior to prior art devices requiring activation immediately prior to start-up. This is because the previous automatic operation has substantially left the engine prelubricated, and therefore only a small volume of oil is needed to reach substantial prelubrication and priming. Programmable control element 20 is electrically connected to electric pump 18 by standard wire means 30a for the purpose of switching and delivering control power from battery 28. In addition, commercially available programmable control element 20 can be customized with voltage sensing logic means to cease all operation if a preset low voltage level is detected. This is specified in order to avoid discharge of battery 28.

Now referring to Fig.1, filter intake conduit 32c is connected to an inlet port of a high arrestance filter 38. High arrestance filter 38 is commercially available with added and enhanced filtering capabilities. Filter 38 is available with substantially higher arrestance rating and chemical removing capabilities than the conventionally supplied oil filter F. Normally provided oil filter F generally performs by removing suspended solid particles larger than approximately 25 microns. High arrestance filter 38 is commercially available with ratings of approximately 1 or 2 microns, such as Norman Filter Company 4300 and 4400 series. The oil discharged from high arrestance filter 38 is substantially free from suspended solid and dissolved contaminants according to the design parameters and rating of filter 38. The automatic process of the present invention will provide for lubricating oil 10 to be substantially free from particles approximately larger than 1 or 2 microns and chemicals removed from the oil according to design parameters of filter 38. These added filtering capabilities will result in reduced engine wear due to increasingly cleaner lubricating oil used for prelubricating and priming.

Still referring to Fig. 1, oil filter 38 outlet is connected to a filter outlet conduit 32d which is connected to an inlet port of a heat exchanger, or a radiator 66. An electric auxiliary fan 68 is also controlled by programmable control element 20. Fan 68 is connected to control element

20 by standard wire means 30c for control power. A temperature sending unit 64 is connected to programmable control element 20 by standard wire means 30d. Sending unit 64 provides a signal to programmable control element 20 to control operation of auxiliary fan 68. Such signal activates programmable control element 20 according to predetermined operating conditions stored in the form of read-only memory as found in well-known commercially available programmable control elements. Temperature sending unit 64 can be a normally open or closed thermal switch to disable or enable the system. Sending unit 64 can be a Thermtrol Corporation, temperature switch Model 1NTO1F-2974. Radiator 66 outlet port is connected to a radiator outlet conduit 32e. A check valve 16, such as Kepner Products Company, Model 2201C-1 cartridge check valve, is installed in series with radiator outlet conduit 32e to prevent backflow of lubricating oil and facilitate electric pump 18 priming. Radiator outlet conduit 32e is connected to a tee hydraulic connector, or a three-way hydraulic coupling 46.

Now referring to FIG. 1, FIG. 2A, and FIG. 2B, three-way hydraulic coupling 46 is provided to simultaneously connect three hydraulic points or systems. These three hydraulic points or systems are the present invention I, the normally provided engine gallery 54 through the normally provided oil filter F, and an outlet of normally provided engine pump 44. It is now apparent to those skilled in the art, that the independence of on demand requirements allows for a simpler and easily installed three-way hydraulic coupling means. Since pressure drop from fluid delivery rate is minimized by independence from delivery time, conduit connecting hardware is by consequence smaller. This coupling can be made in the shape of a flat doughnut with a thickness D within a range of 0.25 to 0.75 inches and connected to the outlet of the present invention, and with an external diameter to match the diameter of the normally provided filter. In addition, an internal diameter, or void, large enough to accommodate a diameter of a normally provided oil filter threaded point of connection T. Now referring to FIG. 1, this thickness allows for the three-way hydraulic coupling 46 to cooperate with the normally provided oil filter threaded point of connection T to further ease installation. Three-way hydraulic coupling 46 is simply sandwiched between filter F and engine block of engine 56. The apparatus of the present invention can easily be installed on a typical engine without the use of specialized tools, or mechanical skills, or drastic modifications to the engine. Of course, another well known accessible point is for a common tee hydraulic connector simultaneously connecting the present invention, the normally supplied engine oil pressure sending unit, and the normally supplied point of connection of the oil pressure sending unit which is generally connected to the engine lubricating gallery. Still referring to FIG. 1, radiator outlet conduit 32e, engine sending unit or engine pump 44 outlet, and engine gallery 54 through filter F, are interconnected by three-way hydraulic coupling 46. In this way lubricating oil 10 is routed into and through engine lubricating gallery 54.

Still referring to FIG. 1, engine lubricating gallery 54 is connected, as part of engine design to smaller galleries connected to typical locations where slidable metallic surfaces exist. Such as, to crankshaft relative motion metallic surfaces 50 and to valve train relative motion metallic surfaces 52. Upon automatic operation of the present invention, lubricating oil 10 is made to flow into engine lubricating gallery 54 through filter F. The lubricating oil 10 drips and flows back to oil sump 12 through natural gravity action after bathing, sticking, and impregnating the substantially purified lubricating oil to relative motion metallic surfaces 50 and 52, thus completing the automatic operating cycle of the present invention.

The operating cycle is defined as the elapsing time of a predetermined duration, and thereafter the elapsing of a predetermined period of time. The predetermined duration, during which the electric pump is actuated, is within a range of 5 to 240 seconds and the predetermined period of time, during which the pump is off, is within a range of 4 to 180 minutes in order to accommodate most operating conditions. The elapsed time of the operating cycle is smaller than the time required for gravity to fully evacuate the lubricating oil from the lubricating galleries and internal moving metallic surfaces. In addition, the system allows for quick and convenient evacuation of the engine oil for purposes of oil change.

Now referring to FIG. 1A, it shows a diagrammatic view of an example mode of connection of the electrical components to further illustrate and clarify their block diagram interconnections in FIG. 1. Battery 28 is connected to standard wire means 30b. Low ampacity fuse 60 is interconnected to wire means 30b. In this connection mode, external controller 42 is interconnected in series with standard wire means 30b by standard wire means 40. External controller can be the commercially available wireless remote control Model RS-650 which controls the state of a normally closed relay NC. Normally closed relay NC is momentarily opened to de-energize programmable control element 20. Upon returning normally closed relay to its normally closed state, programmable control element 20 resets for "on time first" operation.

Power is routed by standard wire means 40 connected to a normally closed relay NC' which is part of programmable control element 20. Programmable control element 20 can be customized with a logic element LE' and a logic element LE'' for temperature sensing and voltage sensing respectively. Relay NC' and electric auxiliary fan 68 are controlled by logic element LE'. Sending unit 64 is connected to logic element LE' by standard wire means 30d and provides its logic input. According to predetermined temperature settings fan 68 is activated by LE' by switching power through an internally to control element 20 electric path B. Voltage sensing logic means V specified for programmable control element 20 provides

input to logic element LE'' to control a normally closed relay NC'' for the purpose of avoiding battery 28 discharge. Control element 20 is available with a logic element LE internally powered by an electric path B' which stores the operating cycle OC in its normally provided non-volatile memory. The operating cycle OC can be alternatively set with duration control knob 22 and frequency control knob 24. Logic element LE controls a normally open relay NO to switch power through wire means 30a to electric pump 18 according to operating cycle OC. Programmable control element 20 is provided with local control switch 26 to activate electric pump 18 locally by bypassing logic element LE through internal electric path connection B''. Internal power connections to logic elements internal to element 20 are well known, but for illustration a set of electric paths B, B', B'', and B''' is shown.

Preferred and Additional Embodiments of Drawings of Group 2

Referring now to the drawings, FIG. 3 shows a diagrammatic view of a second embodiment, or the preferred embodiment of the present invention. Now referring to FIG. 4, this drawing illustrates how the system removes lubricating oil 10 from the volume contained by the normally supplied oil sump 12. This removed oil 10 is made to flow through the modified drain plug 14 which is made to immediately mate to a properly sized inlet port of electric pump 18. This eliminates the need for conduit connecting inlet of electric pump 18 to oil sump 12.

Now referring to FIG. 3 and FIG. 4, Pump 18 operation is controlled by programmable control element 20. Programmable control element 20 is connected to electric pump 18 by standard wire means 30a to switch and deliver control power. Control power is switched according to the programmed operation in programmable control element 20. Programmable control element 20 draws its power and switches control power from battery 28 through wire control means 30b in series with low ampacity fuse 60. Now referring to FIG. 3, it is apparent from observing the drawing figure, that the operation of the present invention is independent of ignition switch operation, and relies solely on the programmed strategy stored in programmable control element 20. This strategy solves the unrecognized problem of inconvenience by providing an automatic device. This leads to design advantages by eliminating complicated wiring and failure points with a device needing one pair of wire means 30b connected to battery 28 and in series with low ampacity fuse 60. In addition, by eliminating the connection to the ignition switch as extensively disclosed in prior art, the present invention provides for an easily installed and electrically safer device. This increased safety is achieved by placing low ampacity fuse 60 at the most upstream point, electrically and physically next to battery 28.

Still referring to FIG. 3, electric pump 18 outlet port is connected to outlet conduit 32b. Outlet conduit 32b is connected to disconnect coupling 34. The complementary part of disconnect coupling 34 is connected to filter intake conduit 32c. Oil 10 is made to flow through high arrestance filter 38, and discharged through oil filter 38 outlet port substantially free from contaminants according to operating parameters of oil filter 38. Oil filter 38 outlet port is connected to conduit 32d. Conduit 32d is connected in series with check valve 16. Check valve 16 is provided to facilitate priming and prevent flow of lubricating oil 10 through the system in reverse flow to normal operation while engine 56 is running. Now referring to FIG. 2A, FIG. 2B, and FIG. 3, three-way hydraulic coupling 46 simultaneously connects the normally provided oil pump 44 outlet, engine lubricating gallery 54 through filter F, and the present invention I.

Due to previously mentioned design advantages gained from the operating strategy, the present invention can be manufactured as a modular unit that directly attaches to the oil pan. In other words, a timed electric pump unit from commercially and readily available hardware. In a developed prototype from commercially available hardware, and without the benefits of further packaging improvements, the active elements of the prototype are confined within a volume of 2.25 x 2.25 x 5 inches. Using a well known aluminum enclosure such as a Box Chassis manufactured by LMB part number 108, a normally stocked B & D Pumps, Inc. model number UGP-2,000 pump, and an American Control Products model number 846J programmable recycle CMOS digital control element. The combined weight is approximately 9.5 ounces. This device is coupled to an Accele Electronics Two Channel Keyless Remote Model RS-650 for remote and on demand operation. The prototype is equipped with a Norman Ultraporous Filter 4300 Series In-Line Filter rated at approximately 2 microns. This prototype installed on a 1981 Porsche 911SC which is equipped with a 3.0 liter 6 cylinder engine, uses an operating strategy of 30 seconds on and 30 minutes off. Energy consumption is approximately 7 amps, electric consumption negligible during off time, pump expected life of approximately 5,000 hours, and digital control element average life of approximately 1 million operations rated at 10 amps. The small energy demand is easily supported by the high cranking and storage capacity of the normally supplied battery, and by the normal recharging during vehicle operation. At 5,000 hours, with the expected life of the pump which is the shortest lived component, the expected life of the device is approximately 34 years with this strategy. This, of course, is possible in the absence of other wear mechanisms. An approximately full evacuation of lubricating oil from the oil sump for an oil change takes approximately 4 minutes.

Now referring to FIG. 4, this third embodiment is the present invention reduced to the simplest yet functional apparatus having a minimum amount of components. It shows the

programmable control element easily incorporated inside the normally provided enclosure E of the electric pump 18. This is easily done since control element 20 circuitry is relatively small. This third embodiment utilizes the same principle of operation and installation of the preferred embodiment. The programmable control element is provided with means or duration control knob 22, means or frequency control knob 24 and local control switch 26. It automatically provides the functions of priming and prelubricating. This embodiment does without inclusion of filter 38, radiator 66, and fan 68. However, it does include customized voltage detection means in programmable control element 20 circuitry to prevent full discharge of battery 28. It includes sending unit 64 connected to control element 20 by wire means 30d. Disconnect coupling 34 is connected to conduit means 32a and 32b. This embodiment is connected to the engine block in the same manner as the preferred embodiment by the three-way hydraulic coupling 46. It is now clear and apparent to those skilled in the art, that the favorable design trade-offs of the present invention operating strategy leads to an automatic, simpler, long-lived, convenient, easily installed, light in weight, compact, efficient, low energy demand, economical, and safe device.

Now referring to FIG. 5, it shows diagrammatically a fourth embodiment of the present invention. This embodiment uses the same method of prelubrication by periodic operation of electric pump 18 by programmable control element 20 in terms of the duration and frequency of operation of pump 18. Now referring to FIG. 6, access to lubricating oil 10 is achieved through a hollow dipstick 70, equipped at its lower end portion opening with check valve 16 in direct fluid contact with lubricating oil 10 contained by the normally provided engine oil sump. Hollow dipstick is also provided with adequate markings at its lower end portion to indicate safe operating oil level in the oil sump. Now referring to FIG. 5, hollow dipstick 70 is dimensioned for insertion into a normally provided and well known engine dipstick well 48. Programmable control element 20 switches control power in the same manner of the preferred embodiment and the numerals refer to the same components. Now referring to FIG. 6, control element 20 is connected to remote operator 42 by standard wire means 40. Temperature sending unit 64 is also connected to control element 20 by wire means 30d. The upper opening of hollow dipstick 70 is directly connected to the inlet port of electric pump 18 through quick disconnect self-sealing coupling 34. Electric pump 18 such as Mercedes Benz Part No. 129-869-00-21 can be used to facilitate fabrication of this embodiment. Electric pump 18 outlet is connected to conduit 32b. Conduit 32b is connected to inlet of high arrestance filter 38. Outlet of high arrestance filter 38 is connected to filter outlet conduit 32c. Tee hydraulic connector or three-way hydraulic coupling 46 is connected in the same manner as the preferred embodiment. Three-way hydraulic connector 46 cooperates with normally provided threaded point of attachment T, and it also connects to engine pump 44 outlet which blocks the flow of injected oil due to its tight mechanical tolerances. Three-way connector is

sandwiched between filter F and engine block of engine 56, by threading T into normal point of attachment of filter F. Three-way hydraulic connector allows for lubricating oil 10 to be discharged into and through engine lubricating galleries 54 through filter F to lubricate crankshaft working surfaces 50 and camshaft and valve train working surfaces 52 to complete the automatic prelubricating cycle as previously described in the preferred embodiment.

A fifth embodiment is shown in FIG. 7, this embodiment departs from the preferred by eliminating most external hardware. This embodiment prelubricates the engine using the method disclosed for the preferred embodiment. This fifth embodiment discloses a pump assembly 80, cylindrical in cross section, which replaces the normally supplied disposable engine oil filter. A diaphragm electric pump 78 is fitted within the volume of pump assembly 80 and attached by a well known welding process, or any other well known bonding means, yielding a weld bead W to an assembly case 74. Assembly 80 encloses components with assembly case 74 mated to an assembly adapter 76. Assembly case 74 is cylindrical in shape to easily replace the normally provided oil filter. Assembly adapter 76 has a threaded section Z' around its outside periphery that mates with a corresponding threaded section Z found in the lower inside periphery of assembly case 74. Assembly adapter 76 is provided with threads T' to allow for attachment to the normally provided threaded point of connection T of the normally provided oil filter.

Assembly adapter is also fitted with a rubber seal G, circular in shape, to properly seal pump assembly 80 to the engine block surface S. Assembly adapter 76 is also equipped with a plurality of orifices O arranged in a circular pattern around its area in contact with pump 44 hydraulic outlet point H. When assembly case 74 and assembly adapter 76 are mated by screwing the mating threads Z and Z', before and upon making contact at surface M they sandwich, seal, and lock in place a transverse oil filter cartridge 72 which is cylindrical in shape, like a hockey puck, between surface M and surface M'. Pump assembly 80 is equipped with an inlet check valve 86, and an outlet check valve 88, which function is needed to leave a sufficient priming volume inside working chamber 90. These check valves are usually an integral part of the well known diaphragm pump. Electric pump 78 inlet is connected by a hydraulic connector 36 to an intake conduit 32. Intake conduit 32 is connected to modified drain plug 14. Modified drain plug 14 replaces the normally provided drainplug and it allows for easy access to lubricating oil 10 normally contained by the oil sump 12.

Still referring to FIG. 7, this embodiment equipped with diaphragm pump 78, shows a position X corresponding to suction, and a position Y corresponding to discharge of lubricating oil 10 contained inside working chamber 90. Charge of oil 10 is discharged into an outlet chamber 84. Electric pump 78 will pressurize lubricating oil 10 in pump working chamber 90,

discharge oil 10 into outlet chamber 84 and deliver it through transverse oil filter cartridge 72 and into the conventionally provided engine lubricating gallery 54. A normally provided internal lubricating pump 44 has tight tolerances which prevent reverse flow through it while not running. Therefore, the pumped oil 10 will flow towards and into gallery 54. Normal filtering while engine 56 operates, is achieved by forced flow through transverse oil filter cartridge 72. Normal operating oil flow is shown by the arrows in FIG. 7. Transverse filter cartridge 72 can be replaced at the time of oil change, by unscrewing and separating assembly adapter 76 from assembly case 74. A bypass check valve 58 is fitted to assembly adapter 76 to allow for oil to continue flowing if transverse filter cartridge becomes clogged due to neglect by the user.

Control power for assembly 80 is switched to electric pump 78 using the same operating method for the preferred embodiment. Control element 20 is connected by wire means 30a to electric pump 78. Programmable control element draws power from the normally provided battery 28 by wire means 30b through an electrical connector 82. Low ampacity fuse 60 is provided in series with wire means 30b to protect for electrical overload. Programmable control element 20, equipped with duration control knob 22 and frequency control knob 24 operates pump assembly 80 as the preferred embodiment with respect to duration and frequency of pump 78 operation. It is also specified with voltage sensing means connected to logic means to avoid full discharge of battery 28. This compact assembly will deliver the desired lubricating characteristics of the preferred embodiment, resulting in automatic prelubrication of engine 56, without an external operator intervention, ease of installation, and with the highest level of convenience not achieved by prior art in the field of the present invention.

Detailed Description of the Drawings of Group 3

The description of the invention does not seek to explain the details of well known prior of art such as an oil filter and its well known internal components, but rather the modification to such well known device resulting from the addition of an external prime mover, a flexible diaphragm, and a check valve scheme to achieve an additional novel and unexpected function.

FIG. 1 shows a cross section of a typical and well known oil filter, cylindrical in shape defined by an oil filter sidewall 36, and equipped with a flexible diaphragm membrane 28 in order to create the present invention: an oil filter pump 62. The oil filter pump 62 of the present invention mates to a conventional internal combustion engine by attaching the device to the normally provided point of attachment for the oil filter in any conventional engine. The filter pump 62 seals against the engine by a conventional circular sealing gasket or oil filter

gasket 10, which is held in place by an oil filter base plate 12, which serves as the bottom supporting structure for the filter pump. Base plate 12 is provided with a plurality of inlet orifices 14 arranged in a circular pattern. Inlet orifices 14 are sealed against back flow by an inlet check valve membrane 18 and a biasing spring 23a. An inlet chamber 19 is defined between the base plate 12 and a bottom base support plate 20. Now referring to FIG. 1 and FIG. 2, once a lubricating fluid 50 is admitted into the filter pump 62 through inlet orifices 14 they are pushed through the base support plate 20 equipped with a plurality of connecting orifices 21 arranged in a circular pattern. Connecting orifices 21 allow for oil to discharge into a filter pump cavity 46. Filter pump cavity 46 is connected through a filtering medium or element 38 to a filter pump pressure chamber 48. Pressure chamber 48 is defined by an inner wall 22 of filter element 38 and is fluidly connected to a pressure working chamber 29 through an orifice 27 of an upper support plate 26. Filtering element 38 is sandwiched between the upper support plate 26 and bottom support plate 20 and held in place by a set of oil filtering element locking blocks 25. A pair of seal gasket 24 is also provided between the upper and lower contact surface of element 38 and plates 20 and 26 to prevent the flow of unfiltered lubricating oil to cavity 48. Pressure cavity 48 is also fluidly connected to an oil filter pump threaded outlet orifice 16 through an outlet check valve membrane 42 biased closed against a plurality of outlet orifices 40 by a biasing spring 23b. Lubricating fluid pressurized inside cavity 48 is forced to flow through check membrane 42 and out into the engine lubricating galleries.

Now referring to FIG. 1, the oil filter pump is shown connected to a mechanical or electric power source or prime mover 150. In the case presented in FIG. 1 a mechanical link is established between the prime mover 150 and the oil filter pump 62. In this embodiment, a power source 128 provides power to actuate a rotatably prime mover shaft, or shaft 148 which is mechanically connected to a rotating element, a wheel or a pulley 146. Pulley 146 is equipped with an eccentric attachment 144. Eccentric attachment 144 is mechanically connected to a flexible rod, cable, or reciprocating shaft 136 and provides means to convert rotary motion into reciprocating motion which is delivered and is mechanically coupled to diaphragm 28 by a threaded connector 112 which is permanently attached to diaphragm 28 through a mechanical interface 30. A circular seal gasket 34 is provided to seal chamber 29 from an air pressure chamber 44. Reciprocating shaft 136 is surrounded by a channel guide, or cable sheath 142. Cable sheath 142 guides and protects reciprocating shaft 136 and connects to oil filter pump 62 by a mechanical connector 140 screwed or attached around an oil filter pump connector 138. Shaft 136 is connected by a permanently attached threaded connector 112 to diaphragm 28. Diaphragm 28 defines the volume of pressure chamber 29, which in turn is connected through orifice 27 in upper support plate 26 to pressure chamber 48. Diaphragm 28 also defines the air pressure chamber 44 between the volume defined by

diaphragm 28 and an upper oil filter pump wall 32. Pressure chamber 48 is also connected to threaded outlet 16 of oil filter pump 62 through outlet membrane 42 opening and through outlet orifices 40.

Referring now to the drawings, FIG. 2 shows an schematic and a system description of all the parts comprising the oil filter pump system prelubricating apparatus attached to an schematic of a typical gasoline, diesel engine block, or internal combustion engine 86.

Still referring to FIG. 2, oil filter pump 62 is connected to the normally provided point of connection of the conventional engine oil filter. The oil filter pump 62 of the present invention is connected to an assembly adapter 120. Adapter 120 mates to a normally provided engine block oil filter mating surface 60. Adapter 120 is connected to a hose 98 through a hydraulic coupling 101. Hose 98 is connected to a hydraulic disconnect coupling 100. Disconnect coupling 100 is connected through a second section of hose 98 to a check valve 94c which prevents oil back flow. A modified drainplug 96 having a center channel is provided to allow lubricating fluid 50 to be evacuated from an oil sump 52 and may substitute or connect to a normally provided drain plug 54. The lubricating fluid 50 will lubricate a plurality of working areas and surfaces such as crankshaft relative motion metallic surfaces 90 and a plurality of camshaft and valve train relative motion metallic surfaces 92 of the internal combustion engine 86. The system of the present invention delivers lubricating fluid 50 in an intermittent or periodic manner and determined by the settings of an electronic controller 68 while the engine is not under operation and engaged in a cool-down period. Inlet check valve membrane 18 and outlet check valve membrane 42 cooperate with flexible diaphragm membrane 28 to effectively convert the conventional oil filter into a diaphragm pump. When prime mover 150 urges membrane 28 away from its unbiased at rest position to increase the internal volume defined by the enclosure, the oil filter 62 will behave as a diaphragm pump in suction mode. When prime mover 150 urges membrane 28 away from its unbiased at rest position to decrease the internal volume defined by the enclosure, the oil filter 62 will behave as a diaphragm pump in discharge mode. The check valve scheme is used to facilitate retention of oil inside the oil filter to facilitate priming and obviously does not have to be located in the filter but can also be located at a remote location in the equivalent hydraulic circuit. The oil filter pump 62 can even do without adapter 120, by allowing hydraulic access through a properly dimensioned sidewall coupling mating with hydraulic coupling 101 in hose 98.

Electronic controller 68 controls the pumping action of the redesigned oil filter to deliver lubricating fluid 50 for a preset duration and frequency into engine lubricating galleries 88 to maintain internal working parts substantially lubricated at all times. This method will provide substantial lubrication of the working areas prior to engine 86 start-up and will continue to

prevent wear during and immediately after, but before a normally internal lubricating pump 53 operation. It will facilitate priming since statistically an engine oil pump pickup tube 56 will be the only part not primed by the present invention. Flow through a normally provided oil outlet tube 58 is prevented since mechanical tolerances in pump 53 are generally tight.

Still referring to FIG. 2, oil filter pump 62 is controlled by electronic controller 68. This method delivers superior performance and very favorable design trade-offs when compared against prior art devices in the field of invention. Electronic controller 68 is well known and is commercially available in customized form from many manufacturers. Controller 68 specified functions are:

- Electronic controller 68 with a duration control knob 70 which allows for controlling and adjusting pump 62 duration of operation, which is proportional to volume of lubricating fluid 50 delivered through the normally provided engine lubricating galleries 88.
- Electronic controller 68 with a frequency control knob 72 which allows for controlling and adjusting oil filter pump frequency or periodic operation, which is proportional to amount of remaining lubricating fluid 50 still in the lubricating galleries 88, and which frequency period is smaller than the time required for oil 50 to evacuate galleries 88 and working surfaces 90 and 92 due to gravity action.
- Electronic controller 68 which allows manual local operation by including a local control switch 74 and remote operation by a remote operator 82 through a control wire for remote operation 80.
- Electronic controller 68 which allows for routing power for oil filter pump operation from electric power source or battery 78.
- Electronic controller protected by a fusible link 75 in series with an electric wire 76 interconnected with battery 78 for preventing electric overload conditions, and to limit short circuit damage
- Electronic controller 68 which ceases all operation if a preset low voltage level is achieved for the purposes of avoiding total discharge of battery 78

Still referring to FIG. 2, the controlling signals from electronic controller 68 are routed to prime mover 150, which will provide the means to urge the perpendicular motion to flexible diaphragm 28. The coupling can be magnetic, mechanical, hydraulic, pneumatic, or the like.

However coupling means are used, the oil filter pump will operate according to the control settings of electronic controller 68. Upon oil filter pump operation, lubricating fluid 50 will be taken from inlet of oil filter pump 62 and pressurize the lubricating fluid 50 to be delivered to filter cavity 46. The charge of lubricating fluid 50 will be pushed through filtering material 38 and into pressure chamber 48 and through threaded outlet 16 at outlet of oil filter pump. Once charge of lubricating fluid 50 moves through the oil filter pump 62 and delivered through threaded outlet 16 of the present invention, the charge of lubricating fluid 50 is directly injected into the engine lubricating galleries 88 of engine 86.

Referring still to FIG. 2, the charge of lubricating fluid 50 suctioned by the system, and then pressurized by the oil filter pump 62 is made to flow in a conventional manner into the lubricating galleries 88 of a conventional and typical internal combustion engine 86. It can be seen that the charge of lubricating fluid 50 made to flow through the lubricating galleries 88 will be distributed and delivered to various working areas of engine 86. In this process, the charge of oil 50 will impregnate engine 86 internal parts and crankshaft working areas 90 and camshaft and valve train working areas 92. After a period of time, the charge or volume of lubricating fluid 50 will flow due to gravity action to be collected in a normally supplied oil sump 52. Now referring to FIG. 1, due to automatic control of controller 68, oil filter pump 62 will deliver charge of oil 50 according to a predetermined adjustable duration and frequency of delivery through the system. Oil filter pump 62 will inject charge of oil or lubricating fluid 50 through normal lubricating routes, since oil filter pump outlet connects to normal lubricating galleries in engine 86 and charge of lubricating fluid 50 will be distributed according to design of galleries 88 throughout the entire engine working areas. Charge of lubricating fluid 50 will tend to flow due to gravity action back to oil sump 52, but if oil filter pump 62 operating cycle is repeated to deliver another charge of oil 50 in the same manner, before all the oil is allowed to evacuate and drip back to the oil sump 52, then a substantial presence of oil 50 is guaranteed at all times in the working areas of engine 86, and prior to any start-up operation of engine 86, therefore preventing wear of engine 86 and avoiding "dry-start" conditions as long as the present invention is allowed to operate as designed.

The charging cycle of oil or lubricating fluid 50 is repeated automatically and controlled by 68, and as long as there is power in battery 78, and no loss of engine 86 oil supply, the automatic lubrication system will perform as a closed system and continuity of periodic flow of oil 50 through the system will continue automatically. It is obvious the on-demand operation is also possible by activating the filter pump through the remote operator 82 which could be a commercially available push button switch or a keyless remote wireless control.

A second embodiment of the present invention is shown in FIG. 3. The same theory of operation is employed in this embodiment. Here, this embodiment departs from the preferred by attaching external hardware to a conventional oil filter 77. Such additional hardware converts the conventional oil filter 77 into a device which automatically lubricates the engine according to the theory of operation of the preferred embodiment. This embodiment consists of an adapter kit assembly 135 which attaches to an ordinary and conventional oil filter. Taking advantage of design trade-offs if on-demand or immediately-before operation is not desired, a relatively small mechanical driver can be coupled to the adapter kit. The mechanical driver will be controlled in the same manner of duration and frequency by an electronic controller as in the preferred embodiment. The mechanical driver or prime mover 150 can be coupled by many means of power transmission such as the reciprocating shaft 136 enclosed by a actuating rod sheath 108. Now referring to FIG. 4 shows a typical illustration of the second embodiment. Engine manufacturers provided generous space around the conventional disposable oil filter. Therefore, enough room is provided to fit the adapter kit to the conventional oil filter. Now referring to FIG. 3, the oil filter pump adapter kit assembly 135 must have a matching sealing surface to the engine. This will be achieved by the adapter 120. Adapter 120 is equipped with an inlet check valve and an outlet check valve 94a and 94b respectively which function is needed to leave a sufficient priming volume inside the oil filter pump and as an integral function needed to convert the conventional oil filter into an effective diaphragm pump. It is also obvious that check valves 94a and 94b can be remotely located from adapter 120 but in the same operational position in the hydraulic circuit. By incorporating the adapter 120 with check valve scheme, fitting the adapter kit, and by puncturing a few small holes in the top surface of the conventional oil filter, the conventional oil filter is now converted into an effective diaphragm pump.

Now referring to FIG. 4, by urging a perpendicular motion to a flexible membrane 114 inside an adapter kit housing 134, attached around an oil filter wall 79 held in place by an oil filter pump adapter kit sealing clamp or band 130, the oil filter now can deliver a volume of oil or lubricating fluid 50 into the normally supplied lubricating galleries in a conventional manner. An oil filter pump adapter kit sealing band adjustment screw 132 is used to attach housing 134 around filter wall 79. An adapter wall seal 118 is provided to avoid leaks from a pressure chamber 124. An oil filter pump adapter seal kit 116 is also provided to avoid lubricating fluid 50 to leak from pressure chamber 124. Pressure chamber 124 is fluidly connected to an oil filter upper cavity 126 by puncturing the upper filter wall 32 of filter 77 with a plurality of orifices. Oil filter pump assembly 135 will pressurize lubricating fluid 50 in an oil filter pump working chamber 49 and deliver it through outlet check valve 94b and through an outlet pipe 84 and into the conventionally provided engine lubricating galleries 88. In this way, this embodiment continues to operate as in the preferred embodiment. Control power for assembly 135 can be obtained in similar fashion as the preferred embodiment

through magnetic coupling, mechanical coupling, or conceivably a solenoid internal to a built up replacement filter.

Now referring to FIG. 4, electronic controller 68 will establish the same operating pattern as the preferred embodiment with regards to duration and frequency of pump mode operation. This compact assembly will deliver the desired lubricating characteristics of the preferred embodiment, resulting in automatic prelubrication of engine 86 crankshaft working surfaces 90 and camshaft and valve train working surfaces 92 automatically, without an external operator intervention, and with the highest level of convenience not achieved by prior art in the field of the present invention.

Referring to FIG. 2 and FIG. 5, electronic controller 68 could be electrically or mechanically connected to oil filter pump 62 through a wire harness or control wiring 66 if the mechanical coupling at the oil filter pump is electromagnetic such as an electromagnetic coil 65, or if it is mechanically coupled then it may be a cable or the like such as in the case of FIG. 1 and FIG. 3. Power driving means or reciprocating shaft 136 can be electric wire, hydraulic, pneumatic, mechanical couplings such as cable or flexible shaft, or similar power transmission means depending on the choice for motive power.

Detailed Description of the Drawings of Group 4

Figure 1 shows a schematic of connection and description of my automatic method and preferred embodiment of my apparatus for preventing and reducing wear in an internal combustion engine 64. A lubricant, mineral or synthetic, lubricating oil 10 contained by a lubricating fluid sump, oil pan or oil sump 12, is allowed to flow through a hydraulic pump inlet 15. Pump inlet 15 is connected to a pressure raising device, fluid delivery device, or electric hydraulic pump 28. Hydraulic pump 28 has an outlet 25 connected through a hydraulic connector 23 to a hydraulic line 19 internal to engine 64 which is in turn connected to a one-way check valve or check valve 29 by a hydraulic connector 26. The check valve 29 is in turn connected to a high efficiency filter 31. Filter 31 filters to a substantially higher efficiency than the normally provided automotive engine filter and removes solid and dissolved contaminants according to filter 31 design parameters. Filter 31 is connected to a main engine lubricating gallery 34 and the injected oil passing to gallery 34 is substantially free from solid and chemical contaminants. This results in increasingly cleaner oil over time due to the present invention operating strategy.

Still referring to FIG. 1, intermittent operation of hydraulic pump 28 is controlled by a commercially available control means, solid state timing control device, adaptive controller, programmable digital logic controller, or electronic controller 54. Electronic controller 54, can

have a very large number of setting combinations to perform automatic operation of hydraulic pump 28 in terms of very large number of combinations of duration of intermittent operation and operating frequency. In a simple embodiment, electronic controller 54 is equipped with a duration adjustment means, or duration control knob 56 and a frequency adjustment means, or frequency control switch or frequency control knob 58. Settings for duration control knob 56 and frequency control knob 58 are independent of each other, and capable of very large number of combination settings within a range continuum in the form of a control knob or a program routine. A local override control knob or local control switch 60 is also provided to override automatic operation and allow on demand operation of hydraulic pump device 28 locally. The integrated pump and controller, essentially a timed pump 17, is mounted or installed by well known means by securing it to oil sump 12 using an oil sump adapter and installation fixture 16 that lends mechanical stability and allows for the timed pump 17 to be safely submerged and having direct fluid connection to lubricating oil 10 inside oil sump 12.

The method of the present invention depends on control means or electronic controller 54 functions. Electronic controller 54 is also well known and is commercially available in standard or customized form from many manufacturers. Electronic controller 54 specified functions for achieving the automatic method of the present invention is common to the most preferred and other embodiments of this invention.

Still referring to Fig. 1, electronic controller 54 with duration control means or knob 56 which allows for controlling and adjusting pump 28 duration of operation, which is proportional to volume of lubricating oil 10 delivered into lubricating galleries 34. The electronic controller 54 with frequency control means or knob 58 which allows for controlling and adjusting pump 28 frequency or period of operation. Such frequency is dependent on various design parameters such as expected ambient temperature to adjust for viscosity gradients, size of the engine, etc. Such frequency of operation will be required to keep lubricating galleries 34 and metallic surfaces substantially lubricated. In addition, the frequency period is smaller than the time required for lubricating oil 10 to evacuate galleries 34, and due to gravity action drip from protected metallic surfaces.

Electronic controller 54 has local control switch 60 which allows for local operation and overriding duration and frequency settings 56 and 58 for the purposes of evacuating all lubricating oil 10 from oil sump 12 after manually connecting to a three-way hydraulic valve 24, shown in FIG. 2, for the purpose of a typical oil change or testing pump 28 delivery volume.

Referring now to FIG. 1, electronic controller 54 allows remote operation by a remote operator 66 through a control wire harness for remote operation 68. Remote operator 66 can easily be a

commercially available wireless remote control or a proximity sensor which can be operated or sensed automatically during walking approach to the automobile engine to be protected. Remote operator 66 can also be in combination with temperature sensors which may intervene in the operation of the device according to ambient temperature and program strategies. Electronic controller 54 allows for routing power for hydraulic pump 28 operation from an electric power source or battery 46. The electronic controller 54 is protected by a fusible link or fuse 50 to eliminate electrical overloaded conditions and limit short circuit damage. In addition, electronic controller 54 ceases all operation if a preset low voltage level is achieved for the purpose of avoiding total discharge of battery 46

Electronic controller 54 is connected to fuse 50 by standard wire means 62 and fuse 50 is connected to battery 46 by standard wire means 48. Electronic controller 54 is electrically connected through fuse 50 to battery 46. Electronic controller 54 is electrically connected to hydraulic pump 28 through a suitable electric wire harness or control wires 21 contained inside the timed pump 17 and it is shown in FIG. 1 to illustrate its construction.

Engine lubricating galleries 34 are connected, as part of engine design to typical locations where frictional metallic surfaces exist, to a crankshaft and crankshaft and connecting rod bearings, or crankshaft relative motion metallic surfaces 36 and a camshaft, camshaft bearings and valve train, or camshaft and valve train relative motion metallic surfaces 38. By having very large number of combination settings for length and frequency of operation of hydraulic pump 28 by electronic controller 54, lubricating fluid 10 volumes can be delivered proportional to the duration of hydraulic pump 28 operation, and with a frequency of operation with a period shorter than the time that gravity requires for the lubricating fluid to evacuate lubricating galleries 34 and drip from relative motion metallic surfaces 36 and 38. Infinite or very large number of time and frequency combinations of hydraulic pump 28 operation will accommodate the great majority, if not all, of requirements depending on size of engine, viscosity of lubricating fluid, hydraulic pump volumetric capacity, ambient temperature, convenience, safety, engine cycle use, operator preferences, among others.

Once lubricating oil 10 is made to flow through engine lubricating galleries 34, the lubricating oil 10 is allowed to drip and flow back to oil sump 12 through natural gravity action after bathing, sticking to, and impregnating the lubricating oil 10 to relative motion metallic surfaces 36 and 38 to complete the automatic prelubricating cycle.

The operating cycle is defined as the combination of the elapsing time of a predetermined duration set by , and thereafter the elapsing of a predetermined period of time. The predetermined duration, during which the electric pump 28 is actuated by control means electronic controller

54, is within a range of 5 to 600 seconds and the predetermined period of time, during which the pump is off, is within a range of 2 to 720 minutes in order to accommodate most operating conditions. The elapsed time of the operating cycle is smaller than the time required for gravity to fully evacuate the lubricating oil from the lubricating galleries and internal moving metallic surfaces and it is performed whether engine 64 is running or not. In the case of an adaptive controller, this controller type learns and optimizes the operating cycle according to programmed parameters and engine 64 operating history. In addition, the system allows for quick and convenient evacuation of the engine oil for purposes of oil change.

Now referring to FIG. 2, this second embodiment departs from the most preferred embodiment by having the timed pump 17, connected immediately outside of oil pan 12. Hydraulic pump 28 inlet 15 is directly connected to oil pan 12 through a modified drain plug 18. Of course, the inlet 15 can be shaped to mate directly to oil sump 12 but it is shown with plug 18 for completeness. The timed pump 17 operates exactly in the same method as described for the preferred embodiment for frequency and duration of operation in FIG. 1. Timed pump 17 is also connected to remote operator 66 through control wire for remote operation 68, and timed pump 17 is also connected to the battery as shown in FIG. 1. Now referring back to FIG. 2, hydraulic pump outlet 25 is connected through hydraulic connector 26 to a hydraulic hose or hydraulic line 22, which in turn is connected to a multiposition valve, or three-way hydraulic valve 24. Still referring to FIG. 2, three-way hydraulic valve 24 allows for mutually exclusive hydraulic connection to hydraulic hose 22A or connection to the outside environment. Normal position of three-way hydraulic valve 24 is to fluidly connect hydraulic hose 22 to hydraulic hose 22A. Second position of hydraulic valve 24 is to fluidly connect hydraulic line 22 to the external environment. Hydraulic hose 22A is connected to check valve 29 through hydraulic connector 26. Check valve 29 is connected to a "tee" or a three-way hydraulic connector 30. Still referring to FIG. 2 connector 30 is connected to a lubricating fluid pressure sending unit 32 and permits simultaneous hydraulic connection of check valve 29, lubricating fluid pressure sending unit 32, and engine lubricating gallery 34. Lubricating gallery 34 is connected by manufacturer design to crankshaft and crankshaft and connecting rod bearings, or crankshaft relative motion metallic surfaces 36 and camshaft, camshaft bearings and valve train, or camshaft and valve train relative motion metallic surfaces 38. Of course, a three-way hydraulic connection can be achieved by the use of an assembly adapter 72 as shown in Fig. 5.

Now referring to FIG. 3, this third embodiment departs from the preferred in that it does not have an integrated pump and controller, but that the electronic controller 54 is remote from hydraulic pump 28. Electronic controller 54 is electrically connected to hydraulic pump 28 by means of electrical control wire harness 21. The method of operation is identical to the one disclosed in FIG. 1 and FIG. 2, but connection to engine block is the same as FIG. 2

Now referring to FIG. 4, this fourth embodiment shows another schematic of connection and description of another embodiment of my automatic method and apparatus for reducing wear in an internal combustion engine. Lubricating oil 10 contained in oil sump 12, is allowed to flow through a hydraulic coupling 20 to allow evacuation of lubricating oil 10 from oil sump 12 and flow through a hydraulic fluid line or hose 22B. Hydraulic fluid line 22B is connected to a quick disconnect hydraulic coupling 27, which is connected to hydraulic line 22C. Part 22C is connected to hydraulic connector 26 and this is connected to pump inlet 15 of hydraulic pump 28. Hydraulic pump 28 outlet 25 is connected to hydraulic line 22D by hydraulic connector 26. Hydraulic line 22D is connected to a three-way hydraulic valve 24. From valve 24, embodiment of FIG. 4 is identical in the description of connection to the engine block as the one disclosed in FIG. 2 embodiment and can also use the connection method of FIG. 5A and an assembly adapter 72 illustrated in FIG. 5B. The operation of electronic controller 54 and method is identical to the embodiments of FIG. 1, 2, and 3.

Now referring to FIG. 5A, this fifth embodiment is identical in method, and theory of operation and in components to embodiment disclosed in FIG. 3. This embodiment of FIG. 5A departs from FIG. 3 only in the inclusion, after check valve 29 in FIG. 3, of assembly adapter 72, which allows for the connection of the system to the inlet circuit of a standard oil filter 74, and the eventual release of lubricating oil 10 through assembly adapter 72 and into a main oil gallery 44. Assembly adapter 72 is more easily appreciated in FIG. 5B which illustrates assembly adapter 72 with a central thread T that matches the normally provided threaded point of connection for a normal oil filter of engine 64. A plurality of orifices O, is disposed around the periphery of central thread T to allow flow of oil during normal engine operation. The present invention injects oil through an orifice O', a membrane M biased against the orifices prevents backflow of that injected oil, essentially making adapter 72 to behave as a check valve. Of course, gap illustrated between membrane M and adapter 72 in FIG. 5B is exaggerated for illustration only. Referring to FIG. 5A, this is done by allowing flow from internal pump 40, through a normally provided engine oil pump discharge tube 42, through adapter 72 and into a main oil gallery 44 but preventing oil flow in the opposite direction. Now referring to FIG. 5B, assembly adapter 72 is used to facilitate the present invention installation and for the purpose of keeping a main lubricating gallery 44 and galleries 34 sufficiently primed at all times due to the periodic injection of lubricating oil 10 by the present invention. Since periodically injected lubricating oil 10 is prevented to flow through the mechanical tolerances of internal pump 40 by adapter 72, the only way to escape and flow back to oil sump 12 is inevitably through the mechanical tolerances that the system intends to protect from wear. Referring to FIG. 5B, this is possible since the injected charge of oil 10 flows through check valve 29 and orifice O' which only connects hydraulically to main oil gallery 44 and not to pump 40 in Fig. 5A. Referring to FIG. 5B, assembly adapter 72, said adapter main body shaped

as a thin hockey puck, allows for easy installation of the device and for easy hydraulic access to the lubricating gallery circuits by connecting the present invention through hydraulic connector 26 which in turn is connected to check valve 29 which prevents lubricating oil 10 backflow during normal engine 64 operation. In fact, anybody with a rudimentary knowledge of an oil change is benefited with this present invention. Furthermore, since oil injection time is ignored, the low flow requirements of the present invention operating strategy allow for the design of the adapter 72 to be very thin within a range of 0.20 to 1.50 inches, because pressure drop caused by flow is irrelevant. This is a favorable design trade-off and it is possible due to my operating strategy. Bulky prior art adapters lack that since prior art must deliver much higher flows with respect to time and therefore require much larger and complicated adapter hardware and larger flow paths. This favorable design trade-off results in adapter 72 which is simply sandwiched between filter 74 and a normally provided engine oil filter mating surface 70 using a set of standard gaskets G as shown in FIG. 5B, and taking advantage of the normal design of the normally provided oil filter threaded point of connection in automobile engines.

Claims

I claim:

1. A method for prelubricating an internal combustion engine having a battery, a drain plug, an oil sump, an engine lubricating gallery, a lubricating oil, said method comprising the steps of:
 - a. providing a controller means coupled to a prime mover for automatically switching control power from said battery according to an operating cycle program;
 - b. programming into said controller means an operating cycle which is defined as the elapsing of an on time and thereafter the elapsing of an off time;
 - c. providing a drain plug pump head adapter attached to said oil sump and which replaces said normally provided drain plug and is mechanically coupled to said prime mover;
 - d. actuating said prime mover according to said on time in step b to pump and discharge said lubricating oil into said engine lubricating gallery;
 - e. thereafter, elapsing of said off time in step b;
 - f. providing an anti backflow adapter which prevents said lubricating oil discharged into said lubricating galleries in step d from seeping out of said galleries;
 - g. programming an optimizing program into said controller;
 - h. providing a plurality of sending unit outputs to said controller to modify said on and off times in step b according to said optimizing program in step g; and
 - i. thereafter, repeating steps d and e automatically according to said operating cycle program in step b, said steps being carried out continuously and independently of whether said engine is operating or not;whereby said engine is automatically and adequately prelubricated and prevented from wear at all times.
2. The method of claim 1 wherein said controller means is and adaptive controller and is coupled to a plurality of sending units whose sending outputs are compared against said operating cycle program in step b to modify said on and off times according to an optimizing strategy stored in said adaptive controller.
3. The method of claim 1 wherein said controller is used for interpreting said plurality of sending unit outputs, and wherein said off time duration of step e is limited to a period of time smaller than the elapsed time for step d to become ineffective in preventing wear.

4. The method of claim 1 wherein a controller means receives control information from a remote controller which gather sending unit outputs such as temperature, oil contamination, fuel, and voltage sensing.
5. The method of claim 1 wherein said drain plug head pump adapter delivers a lubricant to desired surfaces to be protected from wear by overfilling said engine lubricating galleries.
6. The method of claim 1 wherein said drain plug pump head adapter cooperates with said anti backflow adapter minimizing step d.
7. The method of claim 1 wherein a drain plug pump head adapter facilitates disposing of said prime mover away from said oil sump and is remotely coupled to said prime mover means by a powering means.
8. The method of claim 1 wherein said anti backflow adapter is provided with a relief valve to allow for evacuation of said discharged oil in step d from said lubricating galleries.
9. A kit comprising an apparatus for prelubricating an internal combustion engine having a battery, a normally provided oil filter point of connection, an engine lubricating gallery, an oil sump, a drain plug, a lubricant, said apparatus comprising:
 - a prime mover;
 - a drain plug head pump adapter which replaces said drain plug attached to said oil sump;
 - a power transmission means mechanically coupling said prime mover to said head pump adapter;
 - an anti backflow adapter plate which allows said lubricant to flow only in the direction of said lubricating gallery and disposed between a normally provided oil filter and said normally provided oil filter point of connection of said engine;
 - a first conduit means for fluidly connecting said drain plug head pump adapter to said lubricating gallery;
 - a check valve in said first conduit means; and
 - controller means coupled to said battery for automatically powering on said prime mover.
10. A kit in accordance with claim 9 and further comprising an oil recycling reservoir having an end of a conduit means attached to said reservoir and the other end of said conduit terminated with a keyed adapter.

11. A kit in accordance with claim 9 and further comprising a keyed three way hydraulic valve in said first conduit means that has mutually exclusive normal operating flow to said lubricating gallery and a keyed flow to the ambient which can only be selected by utilizing said oil recycling reservoir keyed adapter in claim 10 for the purpose of an oil change.
12. An anti backflow adapter for preventing lubricant flow in the opposite direction of normal operating engine flow, said backflow adapter comprising:
- a flat cylindrical body;
 - a threaded channel at the center of said cylindrical body;
 - a check valve means to allow said lubricant flow in one direction;
 - an orifice connecting a circular side of said cylindrical body where said lubricant flow is allowed to connect to an external lubricant pressurizing system; and
 - a relief valve for the purpose of evacuating said oil from said oil filter and galleries.
13. A kit in accordance with claim 9 and further comprising said anti backflow adapter which is shaped as a flat cylinder and equipped with a threaded center with a plurality of orifices disposed around said threaded center and further including a flexible membrane biased against said plurality of orifices.
14. A method for preventing wear in an internal combustion engine having an ignition switch, a battery, an engine lubricating gallery, a lubricating oil, said method comprising the steps of:
- a. providing a programmable logic control means coupled to an electric pump for automatically switching control power from said battery according to an operating cycle program;
 - b. programming into said programmable logic control means said operating cycle program which is defined as the elapsing of a predetermined duration and thereafter the elapsing of a predetermined period of time;
 - c. actuating said electric pump according to said predetermined duration in step b to pump and discharge said lubricating oil into said engine lubricating gallery;
 - d. thereafter, elapsing of said predetermined period of time; and
 - e. thereafter, repeating steps c and d automatically according to said operating cycle program in step b said steps being carried out continuously and independently of said engine operating status;
- whereby said engine is automatically, adequately and substantially prevented from wear.
15. The method of claim 14 wherein said predetermined duration in step b is within a range of 5 to 240 seconds.

16. The method of claim 14 wherein said predetermined period of time in step b is within a range of 4 to 180 minutes.
17. The method of claim 14 wherein steps c, and e are independent of said ignition switch state, and wherein said operating cycle elapsed time is smaller than the elapsed time for the previous automatic step c to become ineffective in avoiding and preventing wear.
18. A kit comprising an apparatus for preventing wear in an internal combustion engine having a battery, a normally provided oil filter point of connection on the engine block, an engine lubricating gallery, an oil sump, an engine pump outlet, an engine oil pressure sending unit and a normally provided point of attachment, a lubricating oil, said apparatus comprising:
an electric pump;
an inlet side of said electric pump dimensioned to be affixed and fluidly connected to said oil sump;
a first conduit means for fluidly connecting an outlet side of said electric pump to said engine lubricating gallery; and
programmable logic control means coupled to said battery for powering on said electric pump.
19. A kit in accordance with claim 18 and further comprising a modified drain plug having a center channel to allow lubricating oil from said oil sump to flow to the inlet side of said electric pump.
20. A kit in accordance with claim 18 and further comprising a second conduit means for fluidly connecting said modified drain plug to said inlet side of said electric pump to dispose said electric pump away from said oil sump.
21. A kit in accordance with claim 18 and further comprising a check valve in said first conduit means for preventing said lubricating oil to flow from said engine lubricating gallery to said oil sump.
22. A kit in accordance with claim 18 and further comprising a low ampacity fuse interconnected with said battery for preventing electric overload conditions.
23. A kit in accordance with claim 18 and further comprising a high arrestance filter connected in said first conduit means for substantially removing contaminants from said lubricating oil.

24. A kit in accordance with claim 18 and further comprising a temperature sending unit operatively connected to said programmable logic control means for enabling and disabling said electric pump.
25. A kit in accordance with claim 18 and further comprising an external controller operatively connected to said programmable logic control means to activate said electric pump remotely.
26. A kit in accordance with claim 18 and further including a radiator in said first conduit means and an auxiliary electric fan operatively connected to said programmable logic control means for removing heat from said lubricating oil.
27. A kit in accordance with claim 18 and further including a disconnect coupling connected to said first conduit means for removing said lubricating oil from said oil sump.
28. A kit in accordance with claim 18 and further including a three way hydraulic coupling shaped as a flat doughnut having a thickness within a range of 0.20 to 0.75 inches interposed between said filter and said normally provided oil filter point of connection on the engine block for fluidly connecting said apparatus, said engine lubricating gallery, and said engine pump outlet.
29. A kit in accordance with claim 18 and further including in said programmable control means a voltage sensing logic means for ceasing automatic operation of said electric pump if a preset low voltage is detected for avoiding said battery being discharged.
30. A kit in accordance with claim 18 and further including a tee hydraulic connector for fluidly connecting said apparatus, said engine oil pressure sending unit, and said normally provided point of attachment for discharging said lubricating oil into said engine lubricating gallery.
31. An apparatus for preventing wear in an internal combustion engine having, a battery, an oil sump, a lubricating oil, a dipstick well communicating with said oil sump, an engine pump outlet, a normally provided oil filter point of connection on the engine block, an engine lubricating gallery, an ignition switch, said apparatus comprising:
- a hollow dipstick dimensioned for insertion into said dipstick well;
 - a lower end portion of said hollow dipstick opening equipped with a check valve;
 - said lower end portion of said hollow dipstick opening submerged in said lubricating oil contained by said oil sump;

a plurality of adequate markings at said lower end portion to indicate quantity of lubricating oil in said oil sump;
 a first of two complementary parts of a quick disconnect self sealing coupling provided at an upper end portion of said hollow dipstick;
 an electric pump;
 a low ampacity fuse interconnected with said battery to prevent electric overload conditions;
 programmable logic control means coupled to said electric pump for automatically switching control power from said battery and operatively independent of said ignition switch state;
 an inlet side of said electric pump dimensioned as a second of two complementary parts of said quick disconnect self sealing coupling;
 a conduit means connecting an outlet side of said electric pump to said engine lubricating gallery;
 a high arrestance filter connected in said conduit means for substantially removing contaminants from said lubricating oil;
 a temperature sending unit operatively connected to said programmable logic control means for enabling and disabling said electric pump;
 an external controller operatively connected to said programmable logic control means for activating said electric pump remotely; and
 a three way hydraulic coupling shaped as a flat doughnut having a thickness within a range of 0.20 to 0.75 inches interposed between said filter and said normally provided oil filter point of connection on the engine block for fluidly connecting said apparatus, said engine lubricating gallery, and said engine pump outlet.

32. An apparatus for preventing wear in an internal combustion engine having a battery, an ignition switch, an oil sump, an engine pump outlet, a lubricating oil, a normally provided engine oil filter, a normally provided oil filter threaded point of connection, an engine oil gallery, said apparatus comprising:

an assembly case, said assembly case being cylindrical in shape and open at one end, said assembly case dimensioned to replace the normally supplied oil filter which is generally cylindrical in shape, said assembly case provided with a threaded section in the inside periphery next to said open end;
 an assembly adapter circular in shape and dimensioned to be the complement to said assembly case in forming a cylinder, said assembly adapter provided with a threaded section around its outside periphery for matching the threads provided in said assembly case;

a pump assembly formed by mating said assembly adapter to said assembly case by threading their mating threads into each other;
 an electric pump enclosed by said pump assembly and having its outlet fluidly connected to an outlet chamber fluidly connected to an internal volume defined by said pump assembly;
 a first check valve in series with said pump outlet;
 an inlet of said electric pump connected to a conduit means connected to a modified drain plug having a center channel to allow flow and access to said lubricating oil contained in said oil sump;
 a second check valve in series with said pump inlet;
 a transverse oil filter cartridge shaped like a hockey puck whose function is to filter the normal operating flow of lubricating oil while said engine is operating, said transverse oil filter cartridge sandwiched between said assembly case and said assembly adapter, said oil filter cartridge fluidly interposed between the volume defined by the pump assembly and the hydraulic access point to the engine lubricating gallery;
 a female thread centrally provided in said assembly adapter to facilitate connection to said normally provided oil filter threaded point of connection;
 a rubber gasket circular in shape and rectangular in its cross section sandwiched between said assembly adapter and the normally provided oil filter attachment point on the engine block;
 a plurality of orifices arranged in a circular pattern around said female thread of said assembly adapter to allow for fluidly connecting the outlet of the normally provided engine oil pump to the engine lubricating gallery through said transverse oil filter cartridge; and
 a programmable logic control means coupled to said electric pump for automatically switching control power from said battery according to an operating cycle and operatively independent of said ignition switch state.

33. A method for prelubricating an internal combustion engine having a battery, a plurality of engine lubricating galleries, an oil sump containing a lubricating fluid, said method comprising the steps of:

- a providing an electronic controller means coupled to a pump for automatically switching control power from said battery to said pump according to an operating cycle program;
- b programming said electronic controller means with said operating cycle program which is defined as the elapsing of a first period of time added to the elapsing of a second period of time;
- c actuating said pump during the elapsing of said first period of time in step b to pump and discharge said lubricating oil contained in said oil sump into said engine lubricating galleries;
- d thereafter, elapsing of said second period of time; and

e thereafter, repeating steps c and d automatically according to said operating cycle in step b;

whereby said engine is automatically and adequately prelubricated.

34. The method of claim 33 wherein said operating cycle elapsed time is smaller than the elapsed time for the previous automatic prelubricating operation to become ineffective in avoiding substantial dry-start wear.

35. An oil filter pump system replacing a normally provided oil filter and attached to a normally provided point of connection in an internal combustion engine for prelubricating a set of normally provided engine galleries, said engine having an oil sump containing a lubricating fluid, a battery, a normally provided oil filter point of attachment on said engine, comprising:

a rigid enclosure containing within a set of conventional and well known components of a conventional oil filter, and further including a flexible membrane coupled by power transmission means to a prime mover to urge said flexible membrane to change an internal volume defined by said rigid enclosure and said flexible membrane in its unbiased at rest position;

an inlet check valve means to allow lubricating fluid flow into said internal volume;

an outlet check valve means to allow lubricating fluid flow out of said internal volume;

a conduit means for fluidly connecting said inlet check valve means to said oil sump to remove a portion of said lubricating oil while said flexible membrane is urged by said prime mover to increase said internal volume;

an oil filter pump outlet orifice to allow for attachment of said oil filter pump to said oil filter normally provided point of attachment on said engine to fluidly connect to said engine oil galleries to discharge said portion of lubricating fluid while said flexible membrane is urged by said prime mover to decrease said internal volume; and

an electronic controller means coupled to said battery for automatically switching control power to said prime mover.

36. The oil filter pump system of claim 35, wherein said conduit means includes a hydraulic disconnect coupling.

37. The oil filter pump system of claim 35, further comprising a remote operator operatively connected to said electronic controller means to activate said oil filter pump remotely.

38. The oil filter pump system of claim 35, further comprising a fusible link interconnected with said battery for preventing electric overload conditions.

39. The oil filter pump system of claim 35, further comprising a modified drain plug having a center channel to allow lubricating oil from said oil sump to flow into said oil filter pump.
40. The oil filter pump system of claim 35, further including an assembly adapter sandwiched between said oil filter pump and said normally provided oil filter point of attachment on said engine to facilitate connection of said oil filter pump to said engine.
41. An oil filter pump system attached to a normally provided oil filter on an internal combustion engine for prelubricating a set of normally provided engine galleries, said engine having an oil sump containing a lubricating fluid, a battery, comprising:
- a rigid enclosure dimensioned as a cylinder in cross section to mate to a conventional oil filter which is shaped as a cylinder in cross section, said enclosure including a flexible membrane coupled by power transmission means to a prime mover to urge said flexible membrane to change an internal volume defined by said rigid enclosure and said flexible membrane in its unbiased at rest position;
 - a normally provided upper oil filter wall equipped with a plurality of orifices to fluidly connect said rigid enclosure to said conventional oil filter internal volume;
 - an inlet check valve means to allow lubricating fluid flow into said internal volume;
 - an outlet check valve means to allow lubricating fluid flow out of said internal volume;
 - a conduit means for fluidly connecting said inlet check valve means to said oil sump to remove a portion of said lubricating oil while said flexible membrane is urged by said prime mover to increase said internal volume;
 - a normally provided threaded point of attachment of a conventional oil filter to discharge said portion of lubricating fluid into said engine galleries while said flexible membrane is urged by said prime mover to decrease said internal volume; and
 - an electronic controller means coupled to said battery for automatically switching control power to said prime mover.
42. The oil filter pump system of claim 41, wherein said conduit means includes a hydraulic disconnect coupling.
43. The oil filter pump system of claim 41, further comprising a remote operator operatively connected to said electronic controller means to activate said oil filter pump remotely.
44. The oil filter pump system of claim 41, further comprising a fusible link interconnected with said battery for preventing electric overload conditions.

45. The oil filter pump system of claim 41, further comprising a modified drain plug having a center channel to allow lubricating oil from said oil sump to flow into said oil filter pump.
46. The oil filter pump system of claim 41, further comprising an assembly adapter sandwiched between said conventional oil filter and said normally provided oil filter point of attachment on said engine to facilitate location of said inlet and outlet check valve means.
47. An oil filter pump system replacing a normally provided oil filter and attached to a normally provided point of connection in an internal combustion engine for prelubricating a set of normally provided engine galleries, said engine having an oil sump containing a lubricating fluid, a battery, a normally provided oil filter point of attachment on said engine, comprising:
- a rigid enclosure containing within a set of conventional and well known components of a conventional oil filter, and further including a flexible membrane coupled by electromagnetic power transmission means to a prime mover to urge said flexible membrane to change an internal volume defined by said rigid enclosure and said flexible membrane in its unbiased at rest position;
 - an inlet check valve means to allow lubricating fluid flow into said internal volume;
 - an outlet check valve means to allow lubricating fluid flow out of said internal volume;
 - a conduit means for fluidly connecting said inlet check valve means to said oil sump to remove a portion of said lubricating oil while said flexible membrane is urged by said prime mover to increase said internal volume;
 - an oil filter pump outlet orifice to allow for attachment of said oil filter pump to said oil filter normally provided point of attachment on said engine to fluidly connect to said engine oil galleries to discharge said portion of lubricating fluid while said flexible membrane is urged by said prime mover to decrease said internal volume; and
 - an electronic controller means coupled to said battery for automatically switching control power to said prime mover.
48. The oil filter pump system of claim 47, wherein said conduit means includes a hydraulic disconnect coupling.
49. The oil filter pump system of claim 47, further comprising a remote operator operatively connected to said electronic controller means to activate said oil filter pump remotely.

50. The oil filter pump system of claim 47, further comprising a fusible link interconnected with said battery for preventing electric overload conditions.
51. The oil filter pump system of claim 47, further comprising a modified drain plug having a center channel to allow lubricating oil from said oil sump to flow into said oil filter pump.
52. The oil filter pump system of claim 47, further including an assembly adapter sandwiched between said oil filter pump and said normally provided oil filter point of attachment on said engine to facilitate connection of said oil filter pump to said engine.
53. A method for reducing wear in an internal combustion engine having , a battery, an engine lubricating gallery, an oil, said method comprising the steps of:
- a. providing control means coupled to a pump for switching power from said battery according to an operating cycle;
 - b. programming said control means with said operating cycle which is defined as the elapsing of a predetermined duration and thereafter the elapsing of a predetermined period of time;
 - c. actuating said pump according to said predetermined duration to inject said oil into said engine lubricating gallery;
 - d. thereafter, elapsing of said predetermined period of time; and
 - e. thereafter, repeating steps c and d automatically according to said operating cycle;
- whereby wear in said engine is substantially and automatically reduced.
54. The method of claim 53 wherein said operating cycle in step b is defined as said predetermined duration within a range of 5 to 600 seconds and thereafter the elapsing of said predetermined period of time within a range of 2 to 720 minutes.
55. The method of claim 53 wherein steps c and d are carried out continuously and independently of said internal combustion engine operating state.
56. The method of claim 53 wherein said control means is adaptive.
57. An apparatus for reducing wear in an internal combustion engine, said apparatus disposed inside said engine, said engine having a battery, an engine lubricating gallery, an oil, said apparatus comprising:
- a pump;
 - an inlet of said pump fluidly connected to said oil;
 - an outlet of said pump fluidly connected to said engine lubricating gallery; and
 - control means coupled to said battery for operating said pump;

whereby said apparatus disposed inside said engine requires minimum hardware.

58. The apparatus of claim 57 and further comprising a check valve in said outlet of said pump hydraulic circuit.

59. The apparatus of claim 57 and further comprising a high efficiency filter connected to said outlet of said pump for substantially removing contaminants from said oil.

60. The apparatus of claim 57 and further comprising a remote operator operatively connected to said control means for enabling said pump remotely.

61. The apparatus of claim 57 and further comprising a fuse interconnected with said battery for preventing electric overload.

62. The apparatus of claim 57 and further including in said control means voltage sensing logic means for ceasing automatic operation of said apparatus if a preset low voltage is detected for avoiding said battery being discharged.

63. An apparatus for reducing wear in an internal combustion engine, said engine having a battery, an engine lubricating gallery, a lubricating fluid pressure sending unit, a normally provided threaded point of connection for an oil filter, an oil sump, an oil, said apparatus comprising:

a pump;

an inlet of said pump affixed and fluidly connected to said oil sump;

first conduit means connecting an outlet of said pump to said engine lubricating gallery; and

control means coupled to said battery for operating said pump;

whereby said apparatus is disposed outside said engine.

64. The apparatus of claim 63 and further comprising a modified drain plug having a center channel to fluidly connect said inlet of said pump to said oil contained in said oil sump.

65. The apparatus of claim 63 and further comprising a check valve in said first conduit means.

66. The apparatus of claim 63 and further comprising a second conduit means for fluidly connecting said modified drain plug to said inlet side of said pump.

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67. The apparatus of claim 63 and further including a three way hydraulic valve interposed in said first conduit means.

68. The apparatus of claim 63 and further comprising a remote operator operatively connected to said control means for enabling said pump remotely.

69. The apparatus of claim 63 and further including in said control means voltage sensing logic means for ceasing automatic operation of said apparatus if a preset low voltage is detected for avoiding said battery being discharged.

70. The apparatus of claim 63 and further including a three way hydraulic connector for fluidly connecting said apparatus, said lubricating fluid pressure sending unit, and said engine lubricating gallery.

71. An assembly adapter interposed between a normally provided engine oil filter mating surface of an internal combustion engine and a normally provided standard oil filter, said engine having a normally provided threaded point of connection for said filter, an oil, an internal pump, a main oil gallery, said adapter comprising:

a main body shaped as a thin hockey puck having a centrally located threaded channel that matches said normally provided threaded point of connection for standard filter;

a plurality of orifices disposed around said threaded channel to allow flow of said oil through

said main body;

a flexible membrane biased against and covering said plurality of orifices to prevent flow in the direction of said engine oil filter mating surface and to allow flow in the direction of said normally provided standard oil filter;

a gasket set to seal said adapter when interposed between said normally provided engine oil filter mating surface of said internal combustion engine and said normally provided standard oil filter;

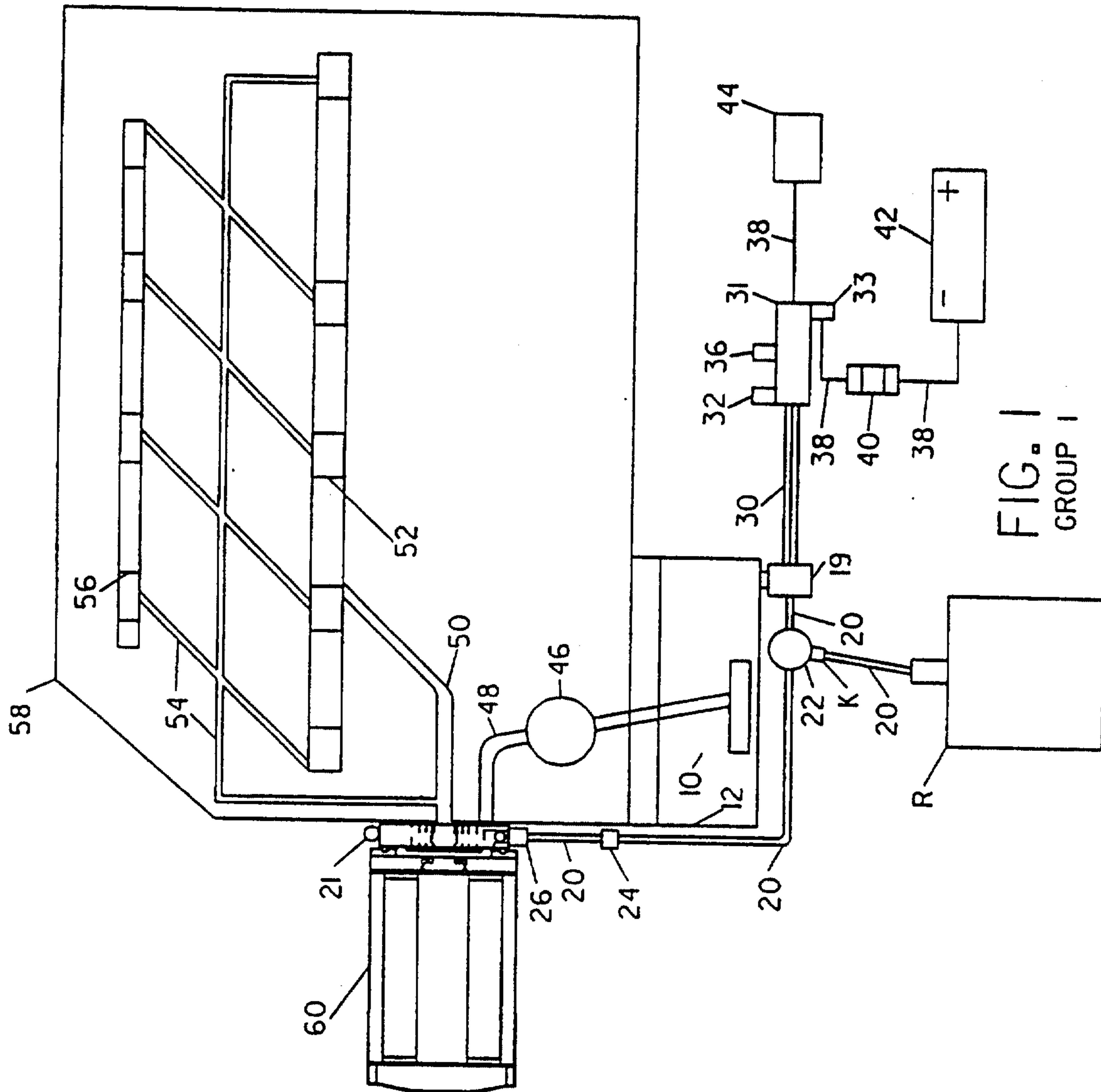
an orifice disposed outside the area covered by said membrane having fluid communication in

the direction of said normally provided standard oil filter and the atmosphere;

a check valve fluidly interposed between said orifice and the atmosphere;

whereby access to said main oil gallery is substantially facilitated and oil is prevented to back flow.

72. The assembly adapter of claim 19 wherein the thickness of said main body is within a range of 0.20 to 1.50 inches.

FIG. 1
GROUP I

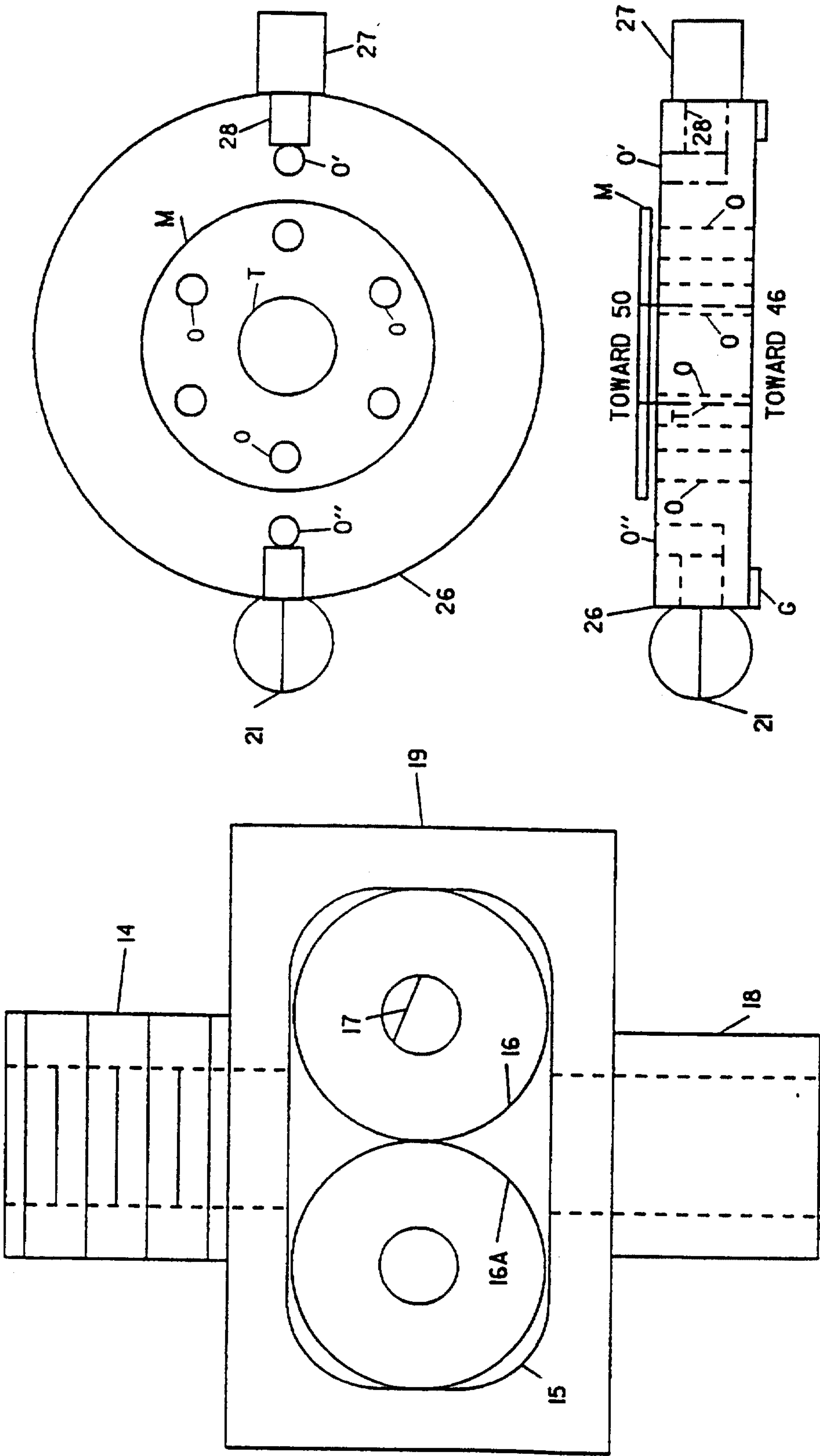
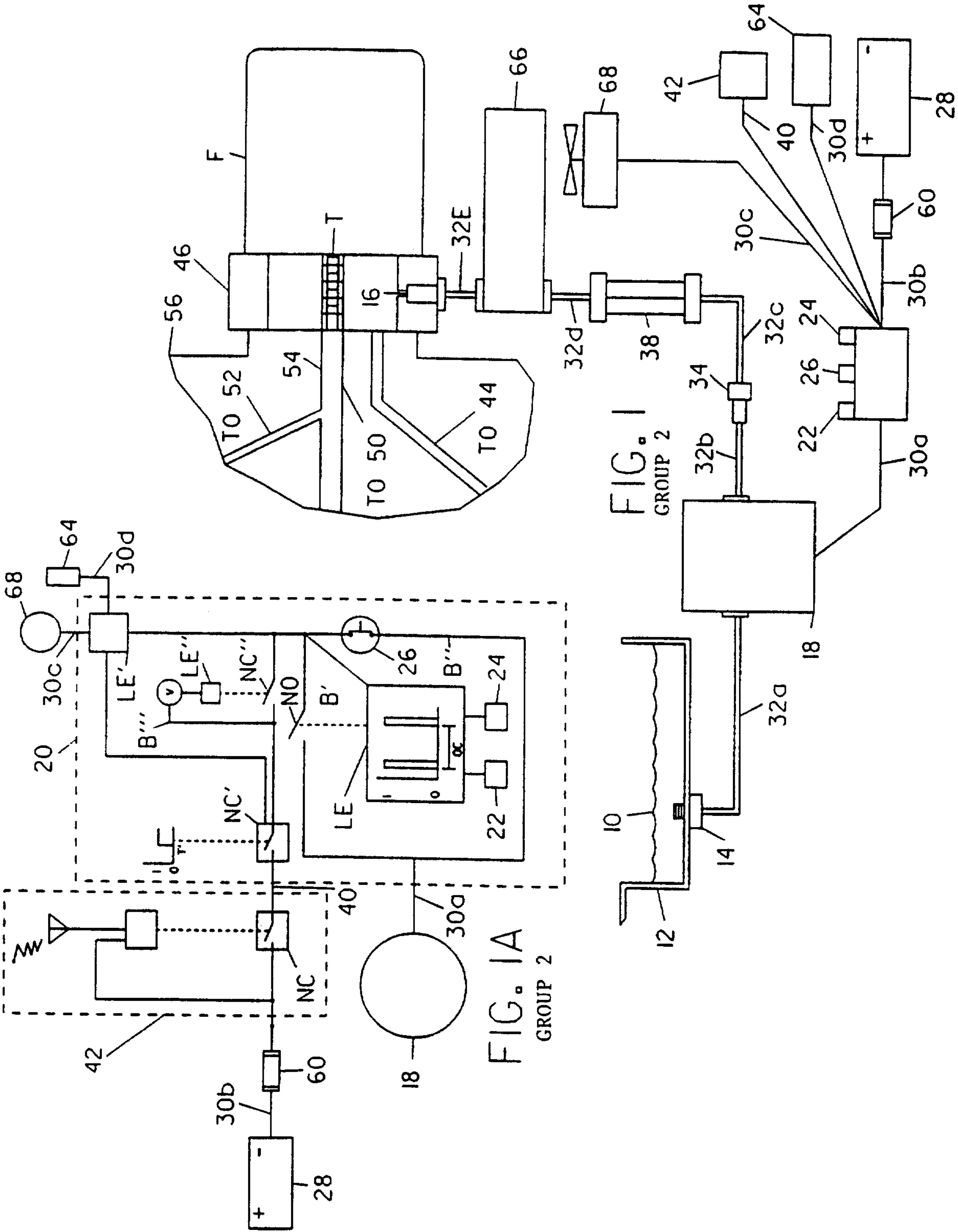


FIG. 3
GROUP 1

FIG. 2
GROUP 1



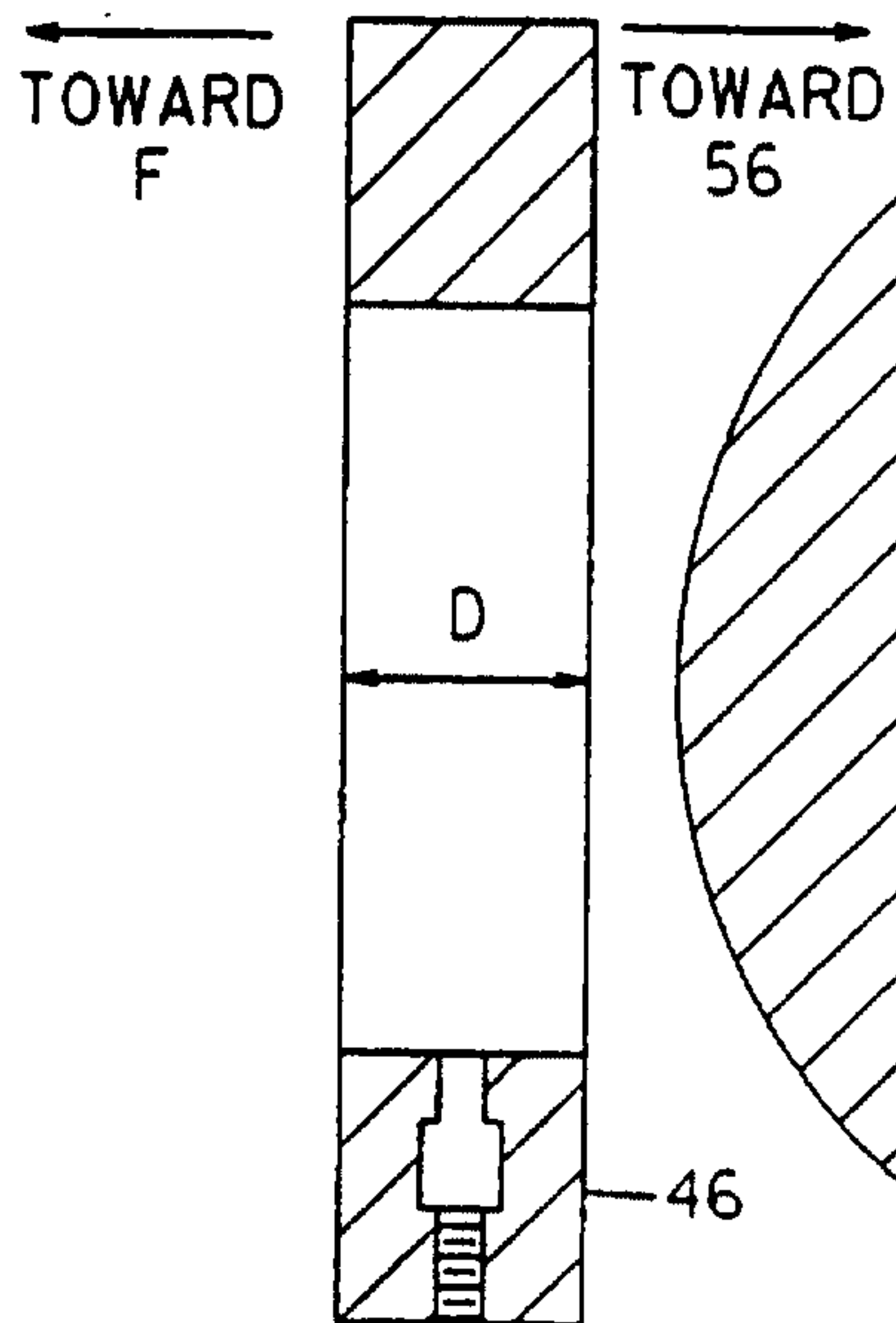


FIG. 2A
GROUP 2

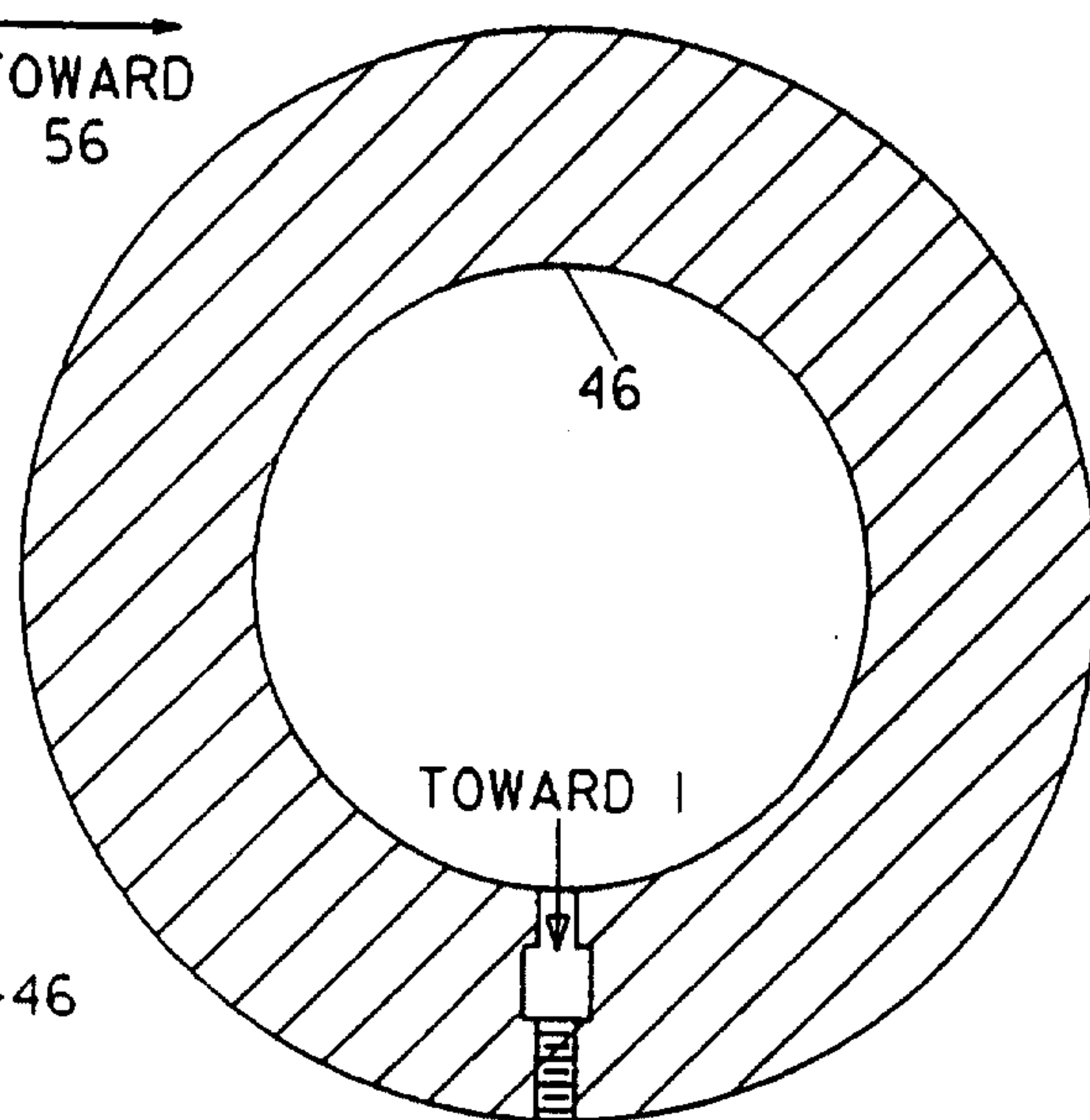


FIG. 2B
GROUP 2

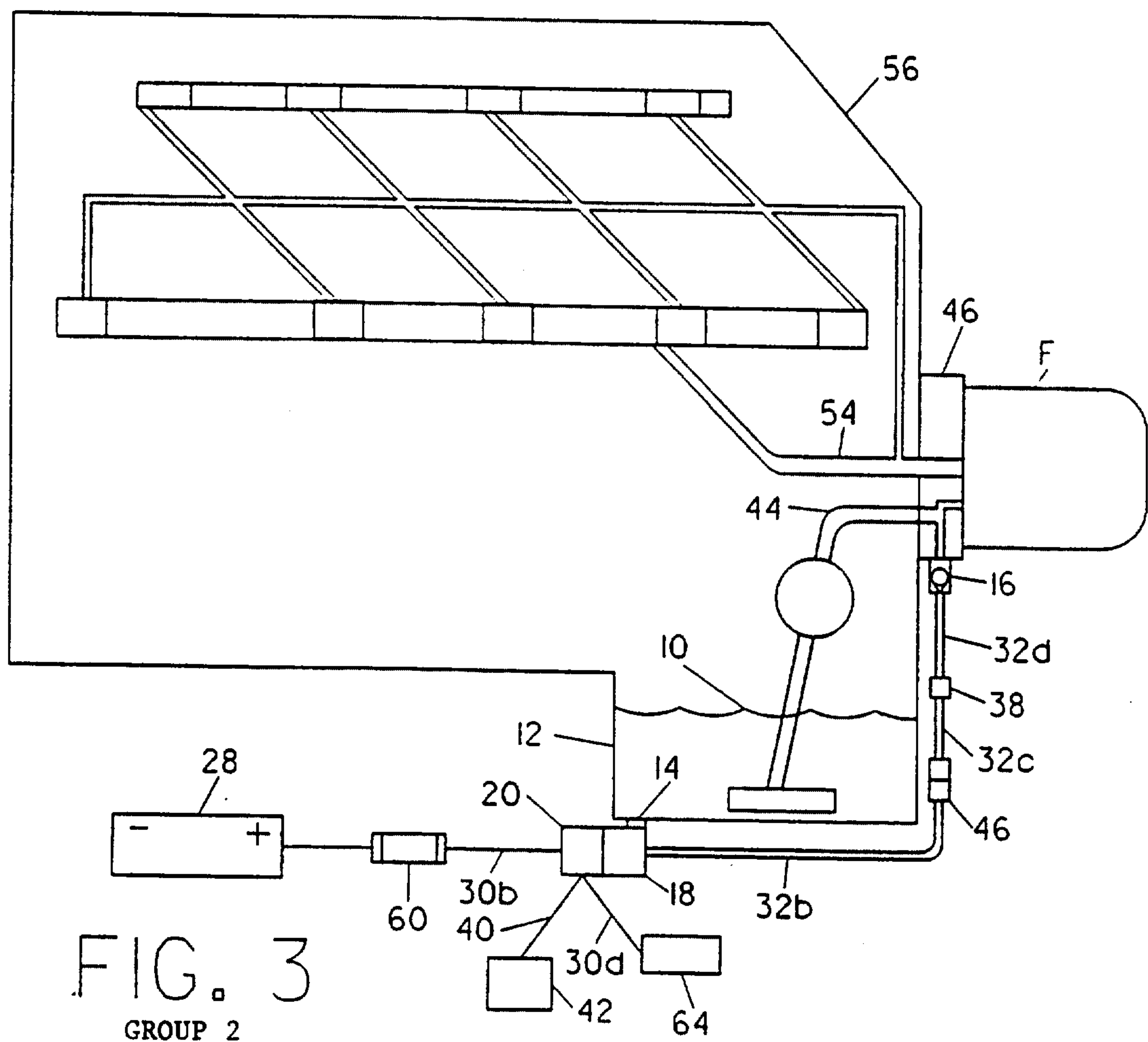


FIG. 3
GROUP 2

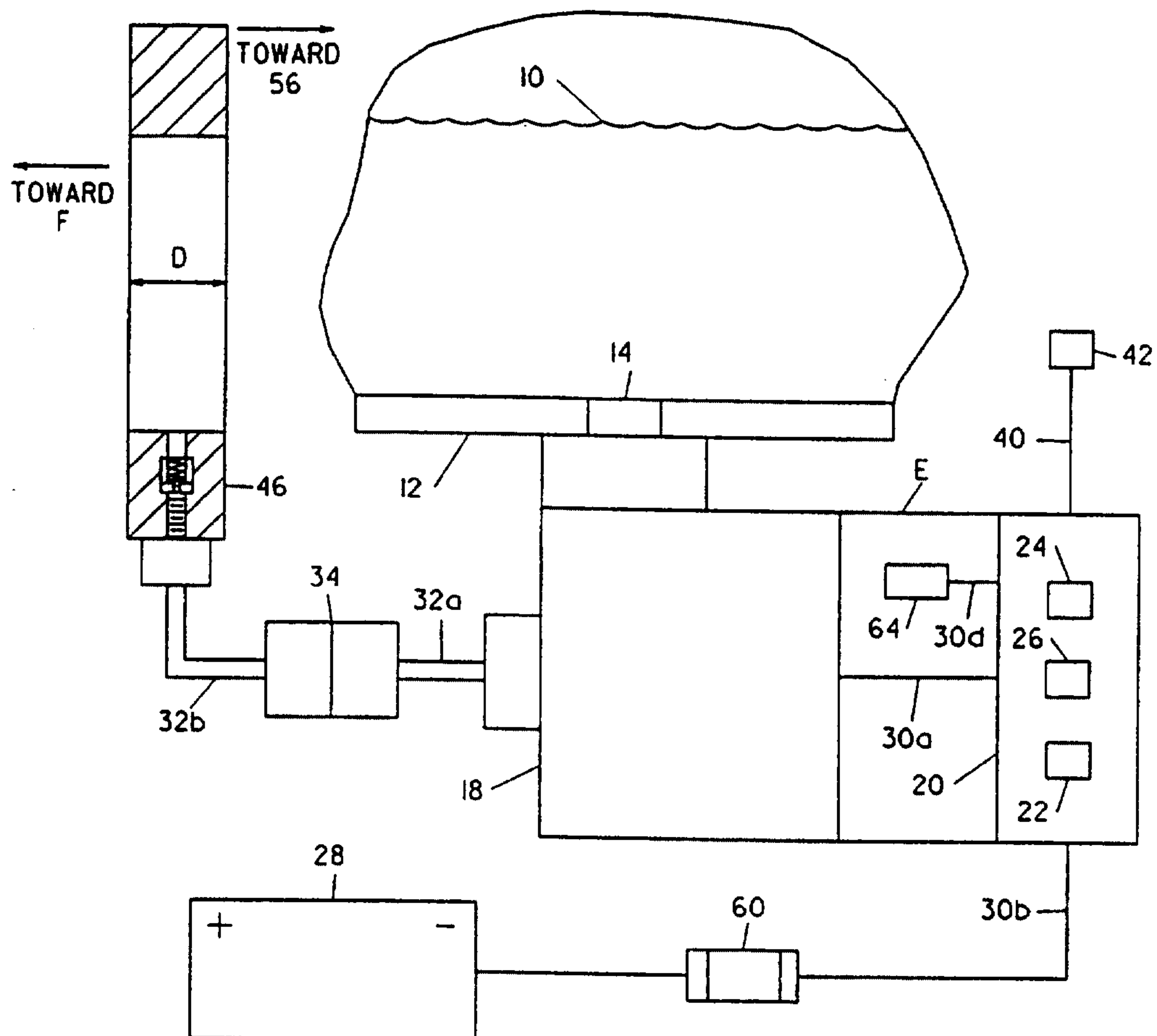


FIG. 4
GROUP 2

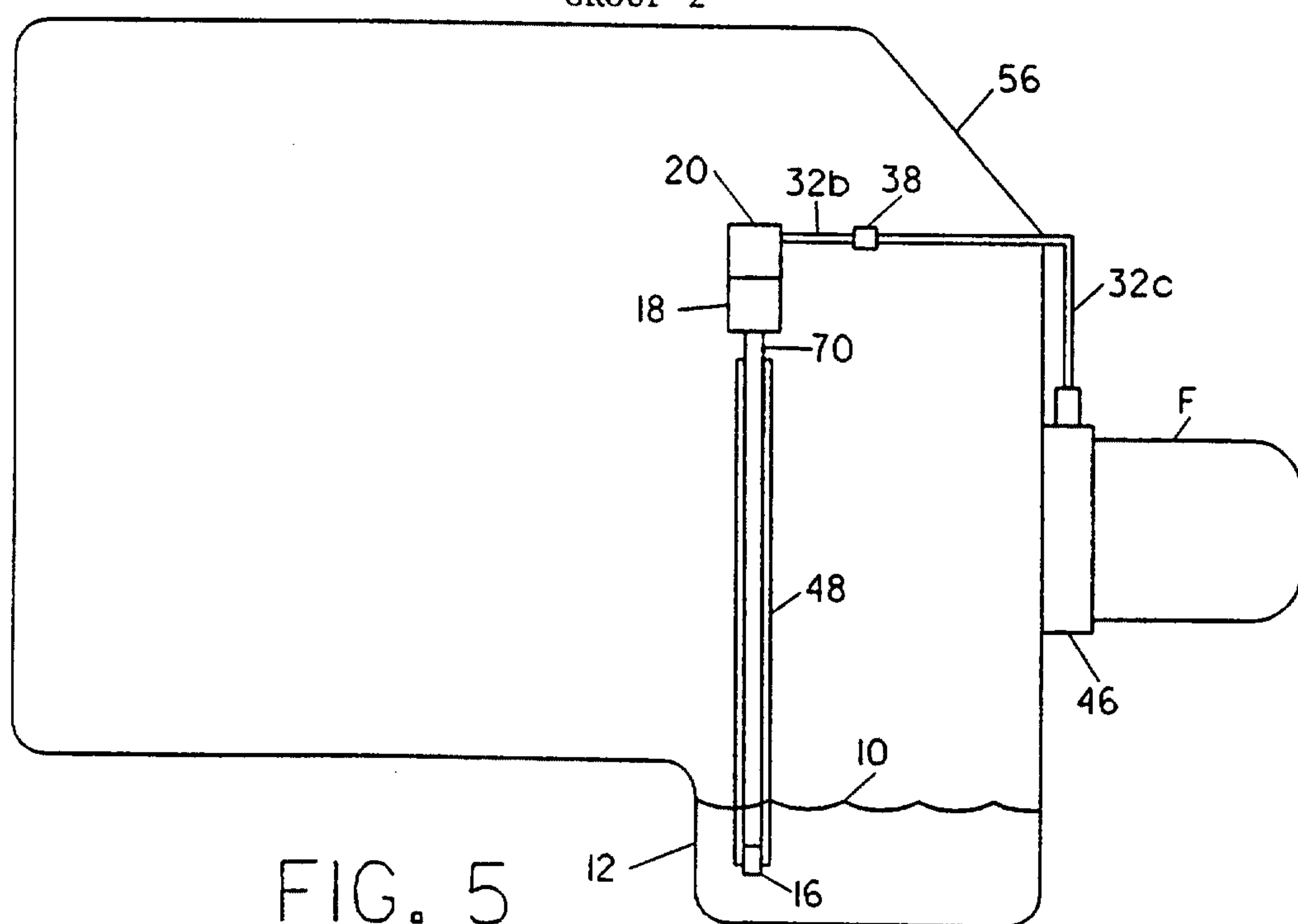


FIG. 5

GROUP 2
SUBSTITUTE SHEET (RULE 26)

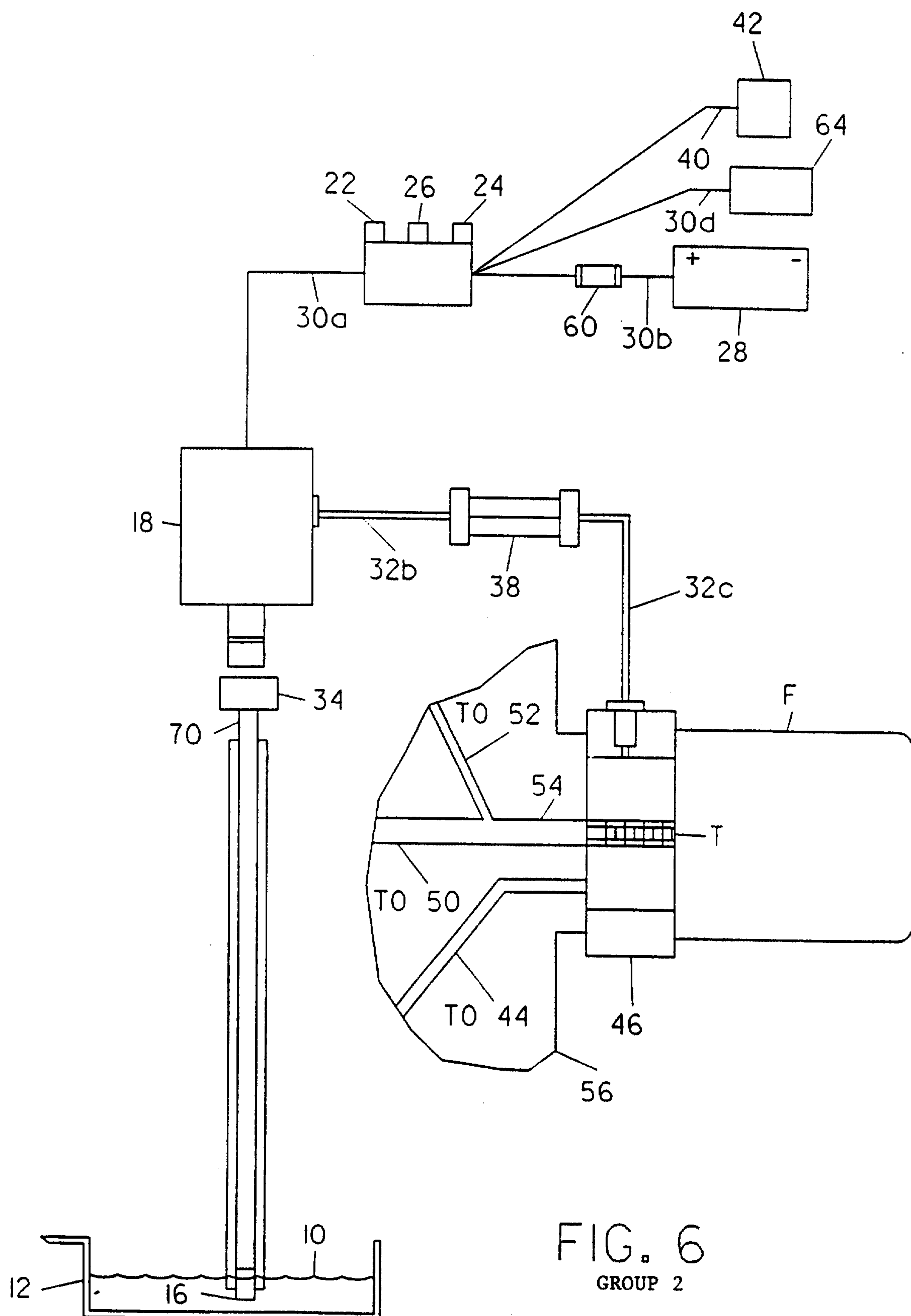


FIG. 6
GROUP 2

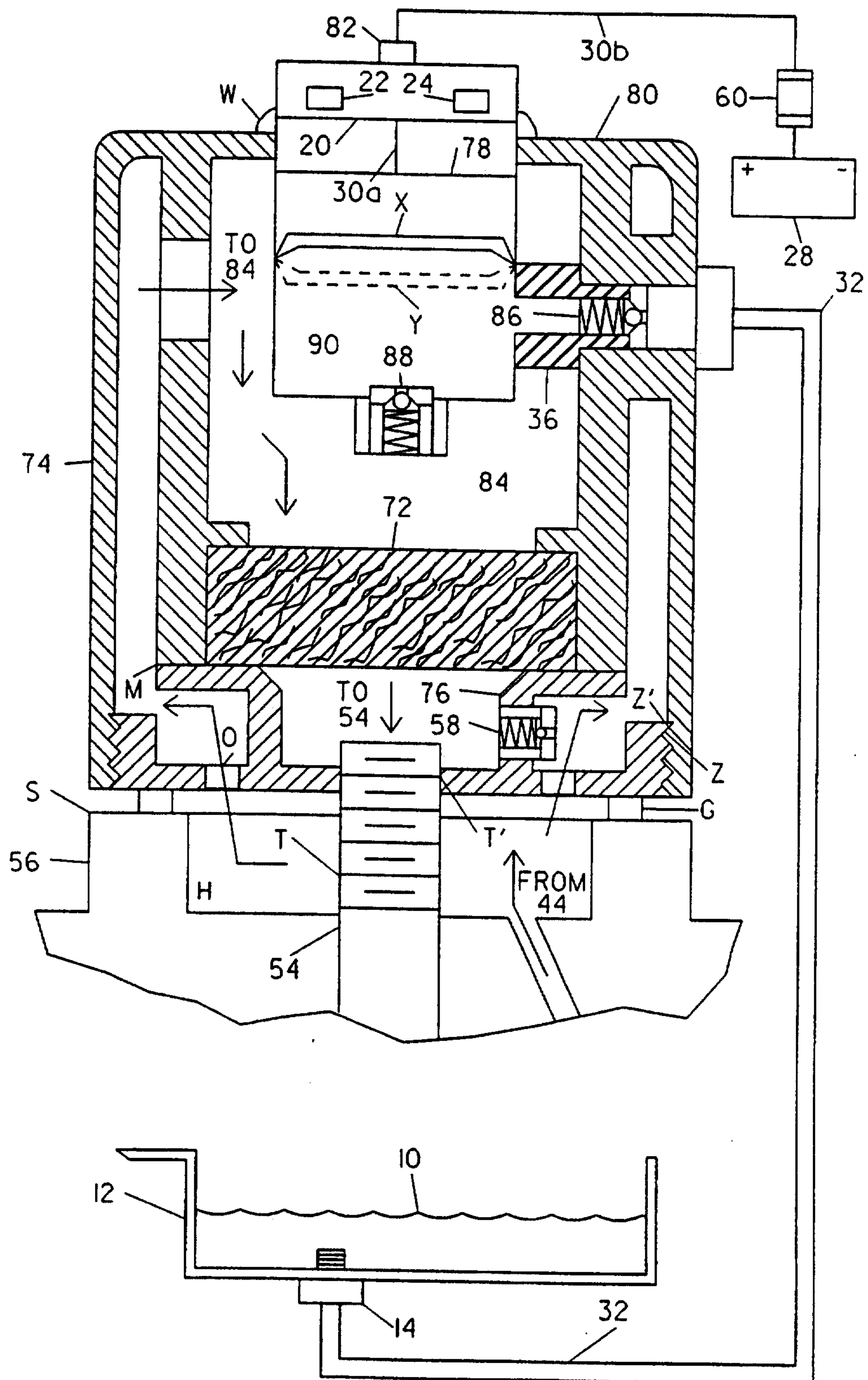


FIG. 7

GROUP 2

SUBSTITUTE SHEET (RULE 26)

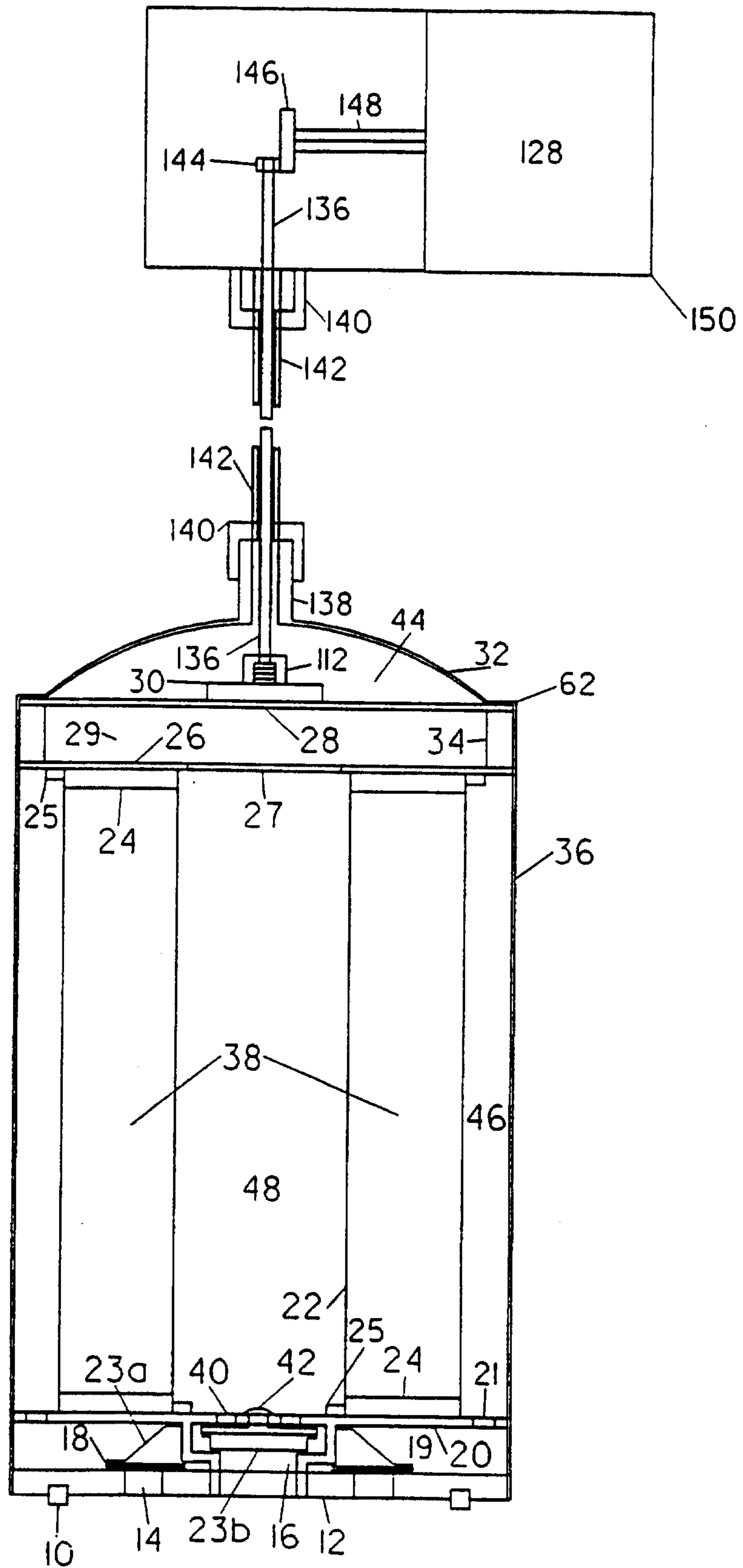


FIG. 1
GROUP 3

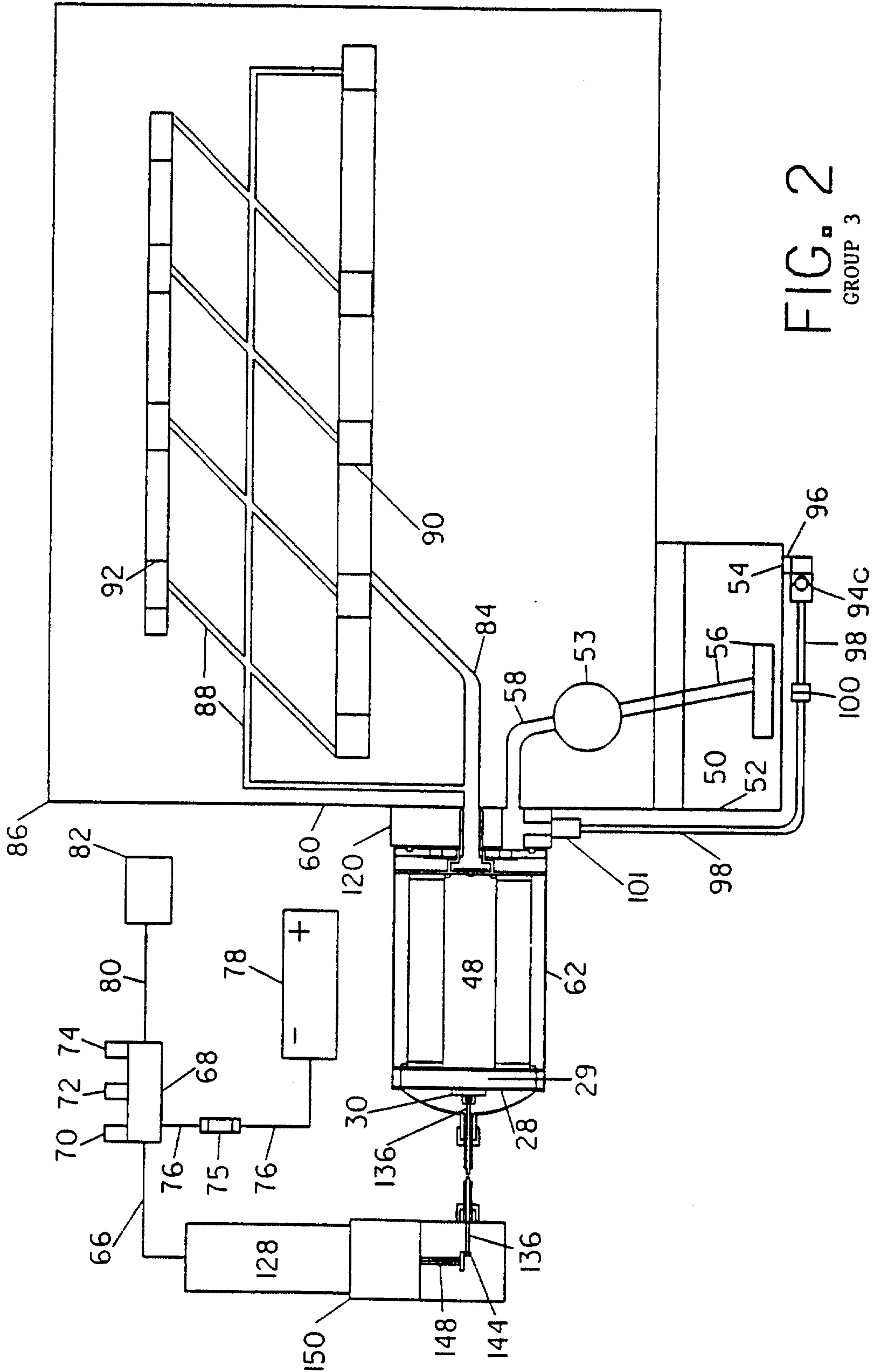


FIG. 2
GROUP 3

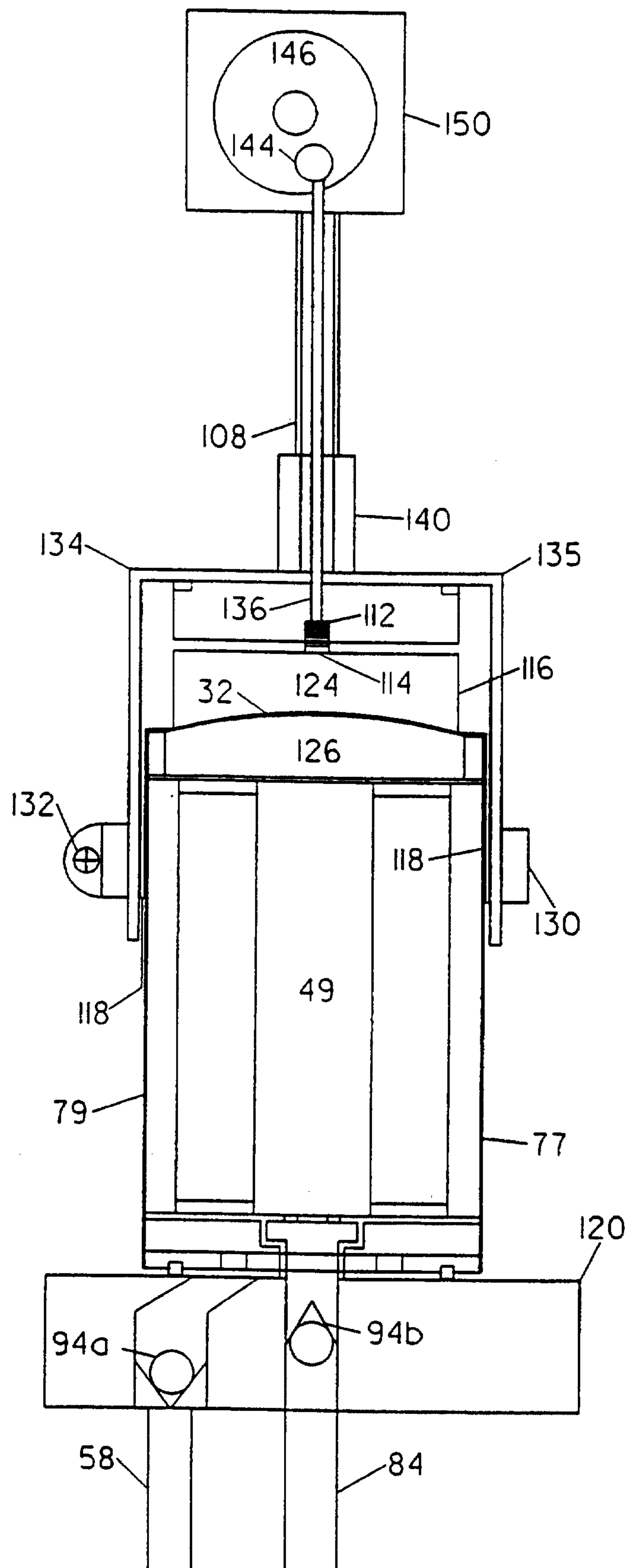


FIG. 3

GROUP 3

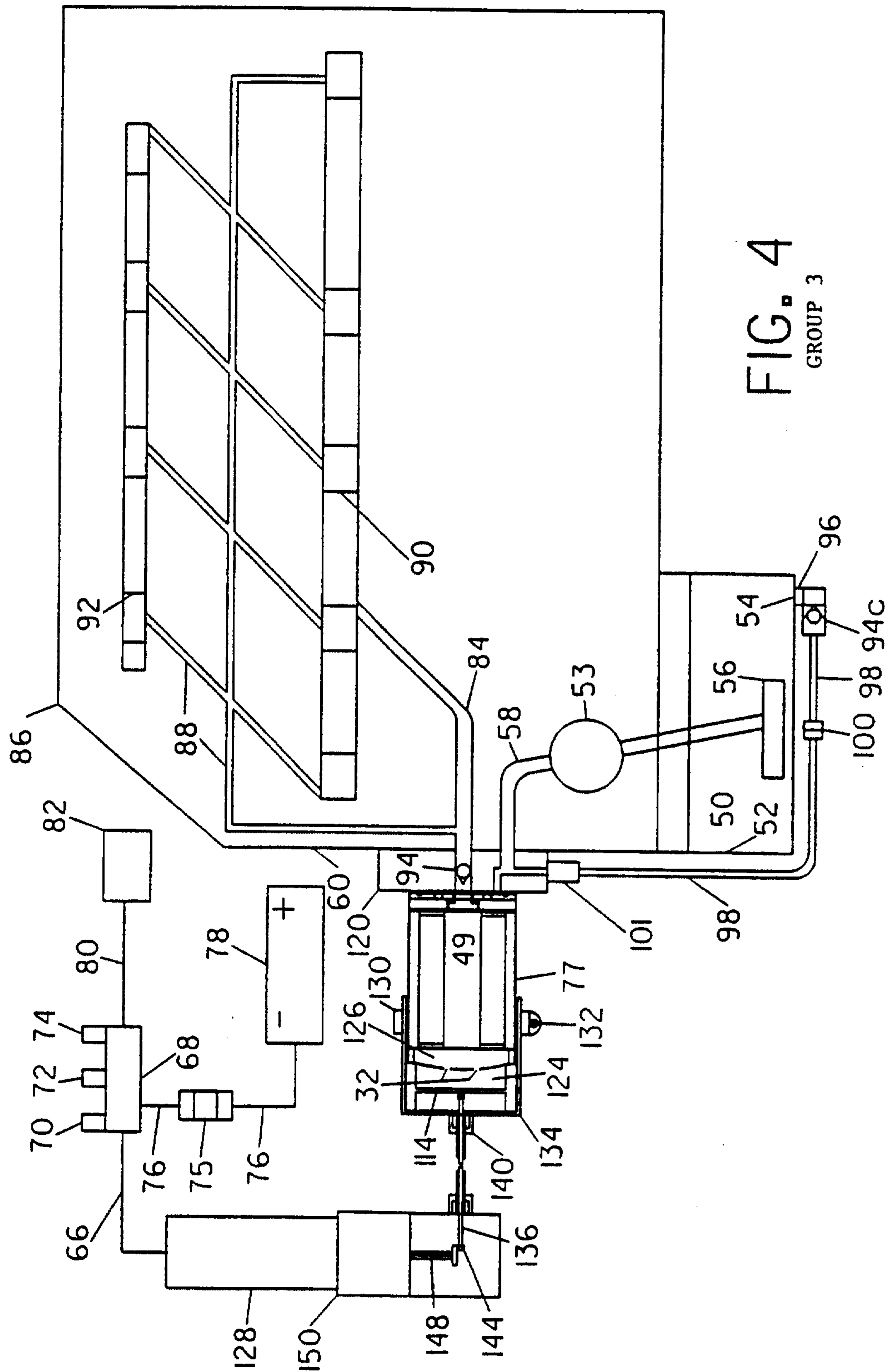


FIG. 4

GROUP 3

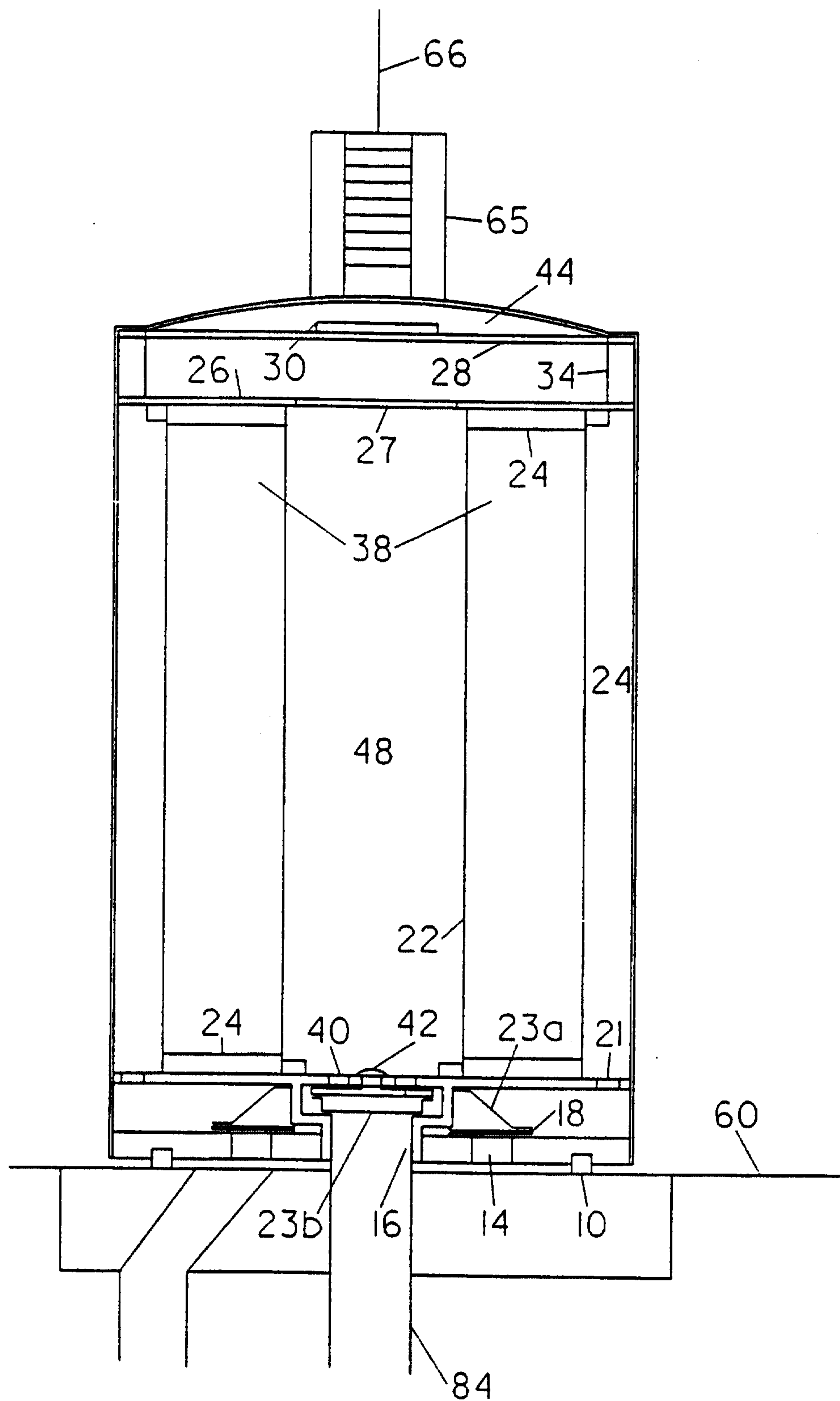


FIG. 5

GROUP 3

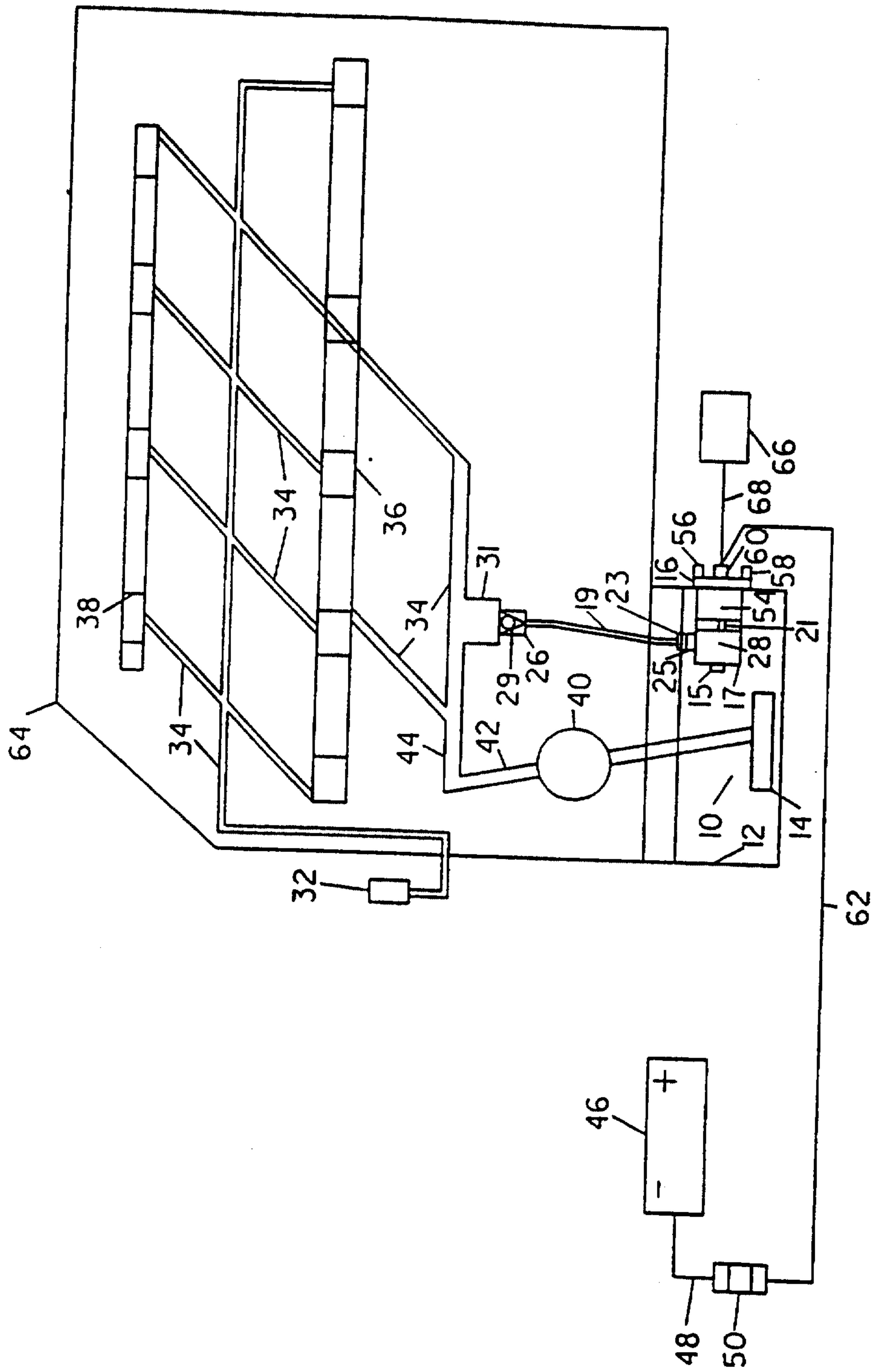


FIG. 1
GROUP 4

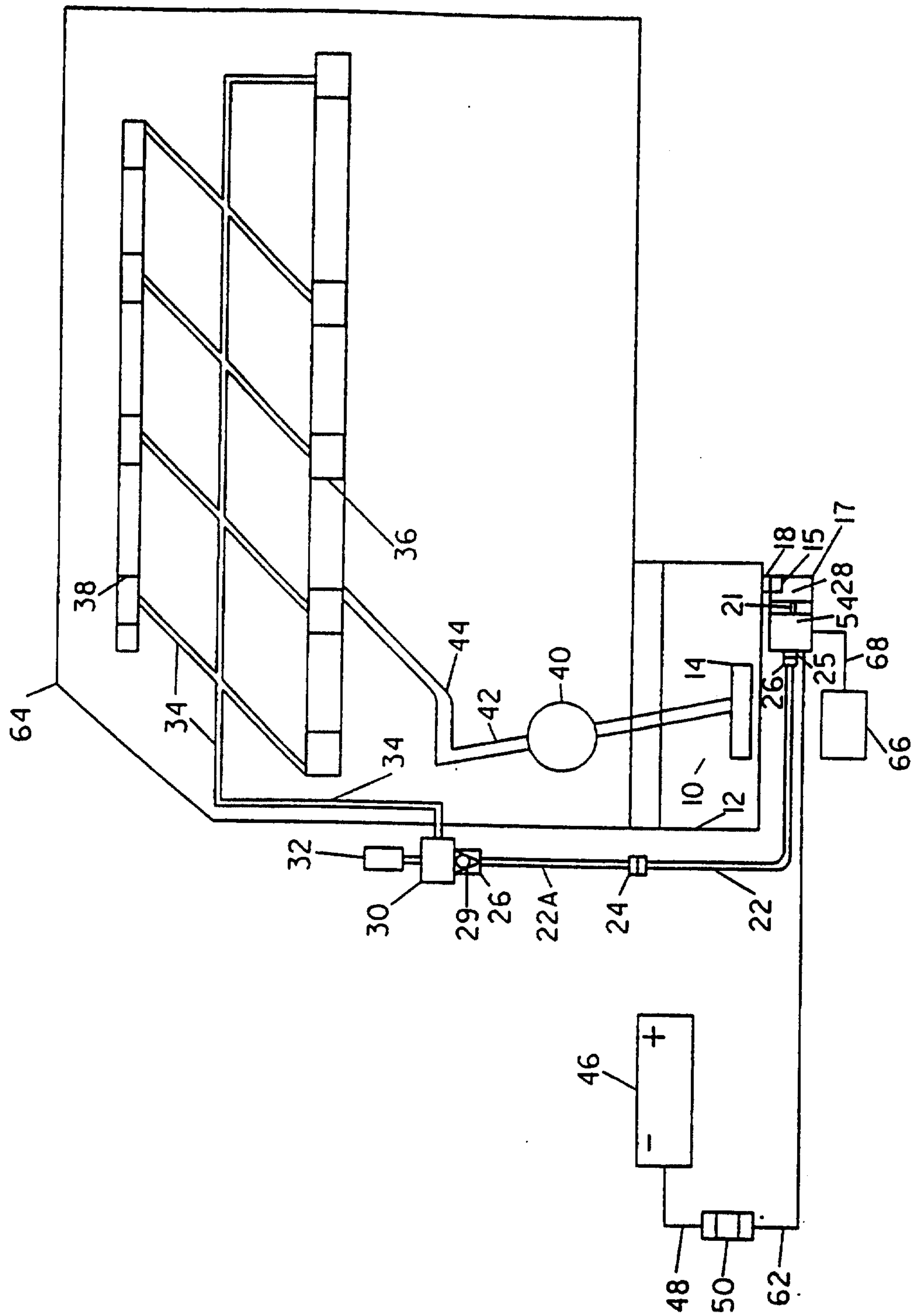
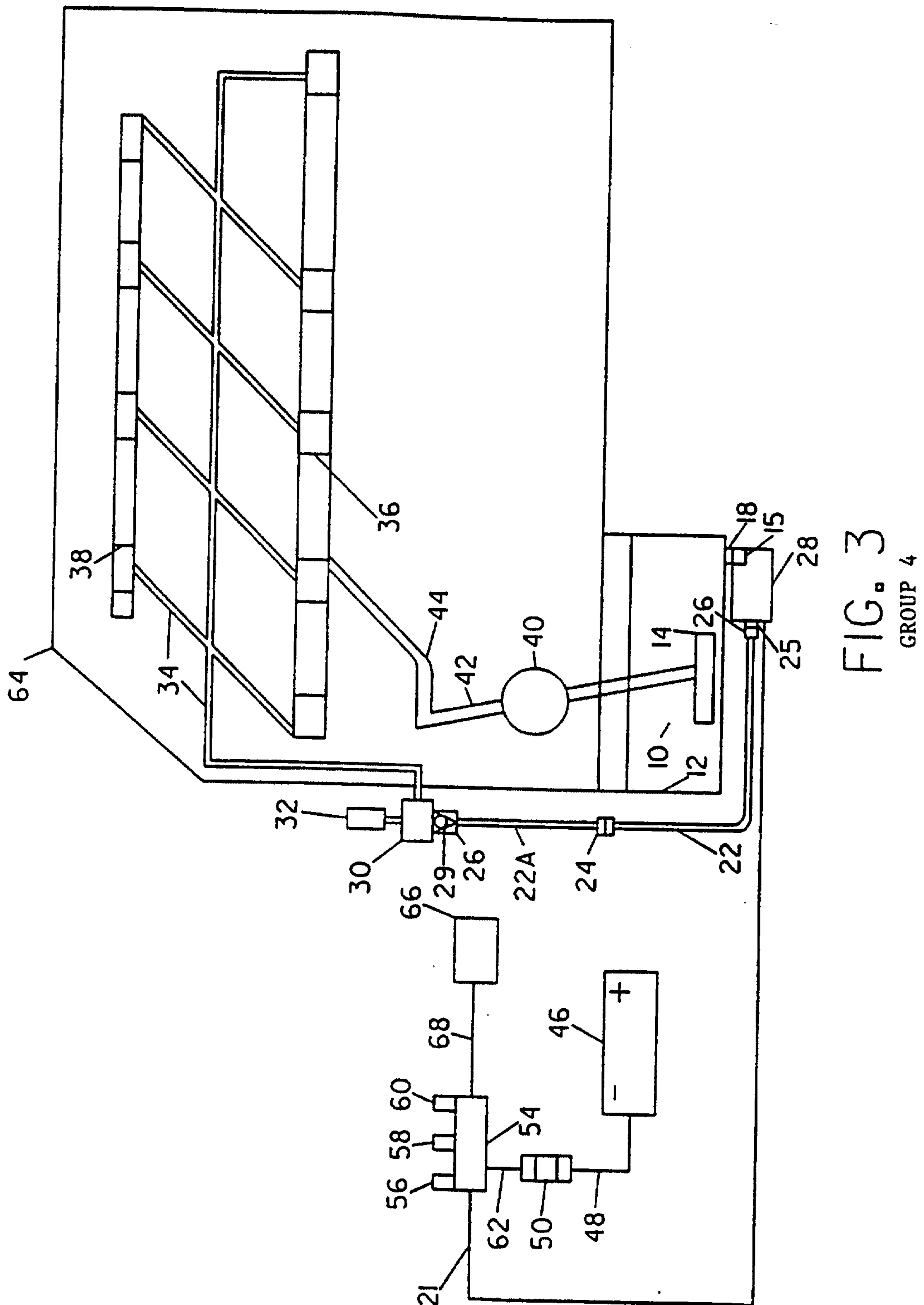
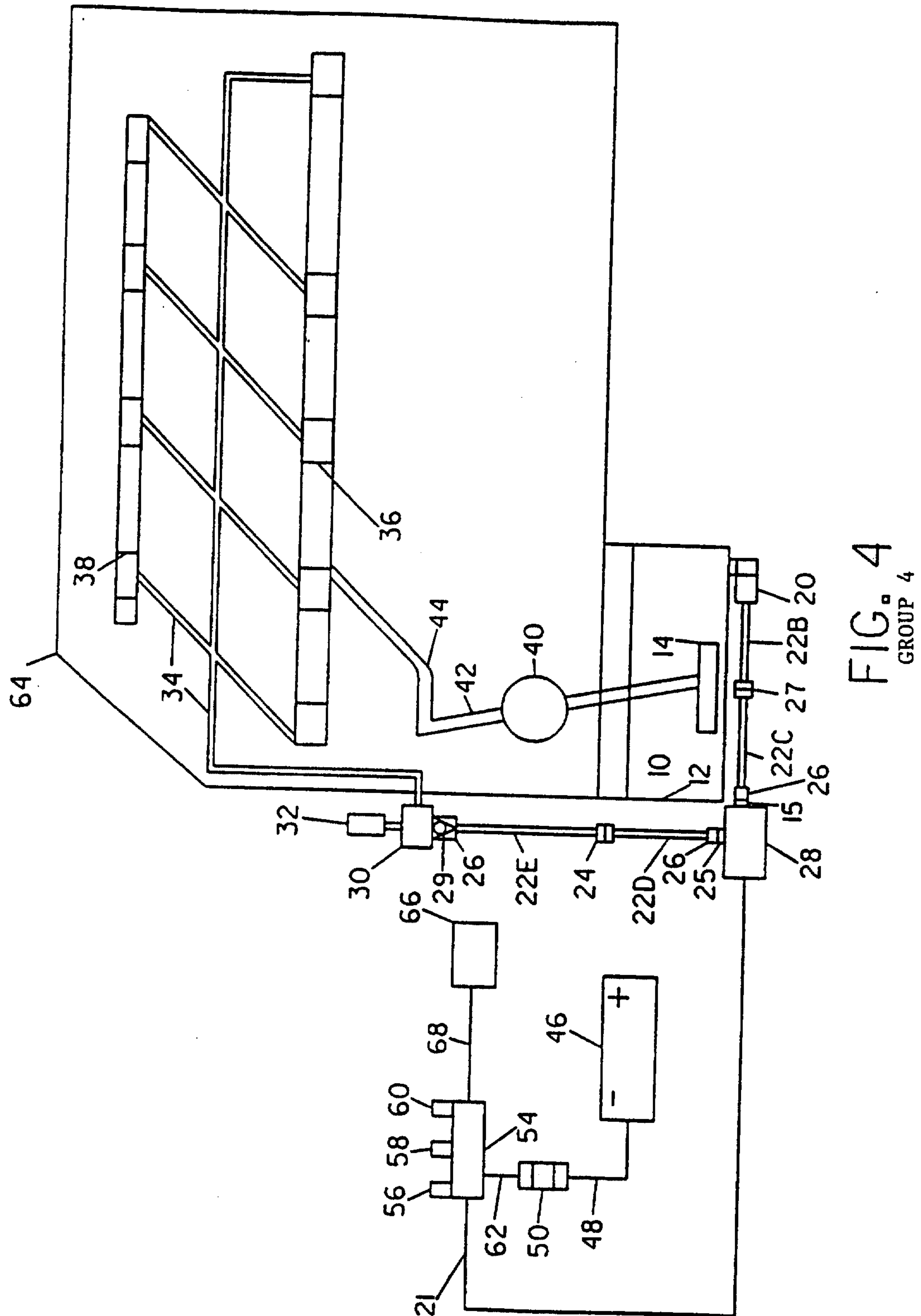
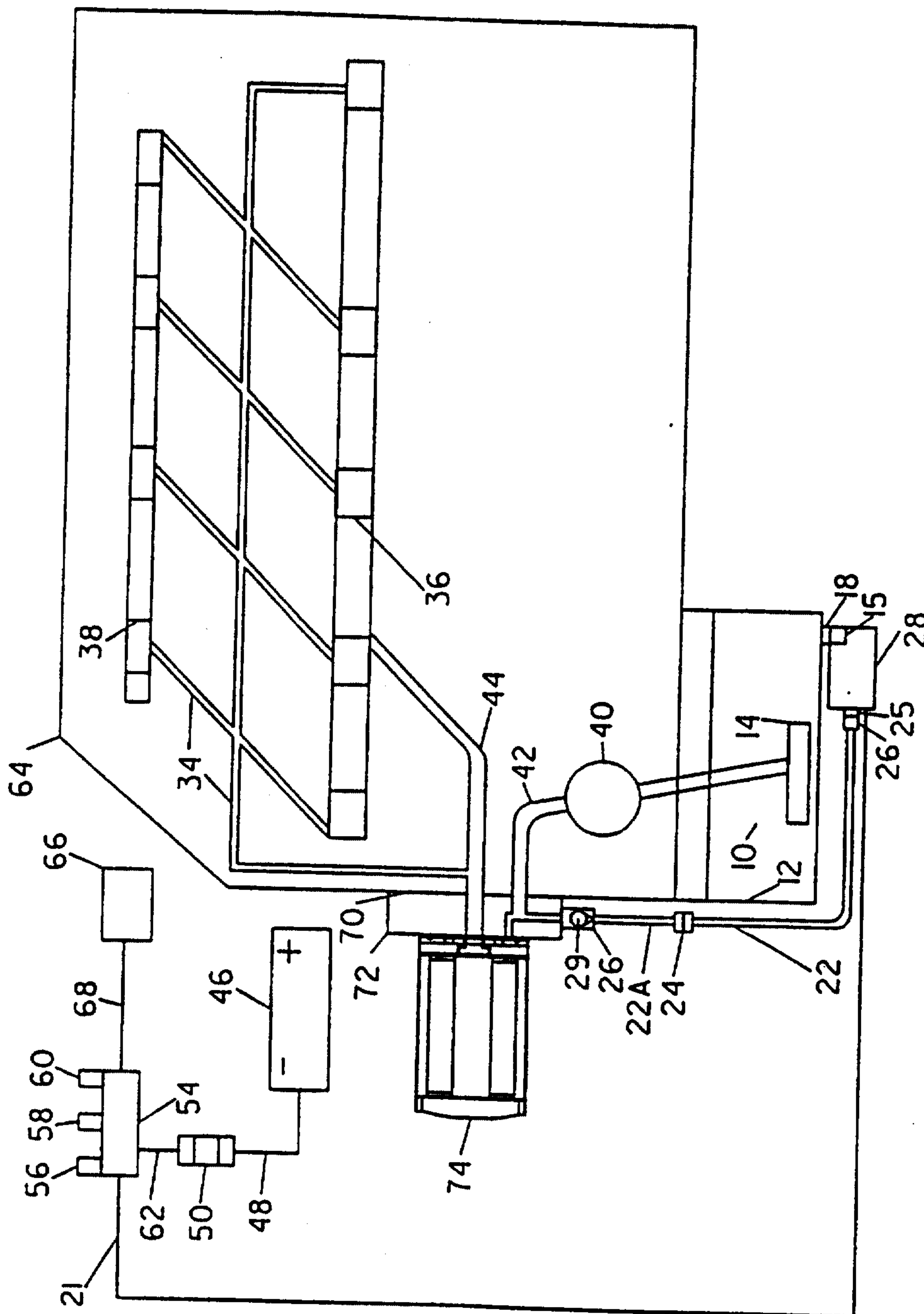


FIG. 2

GROUP 4





FIG. 5A
GROUP 4

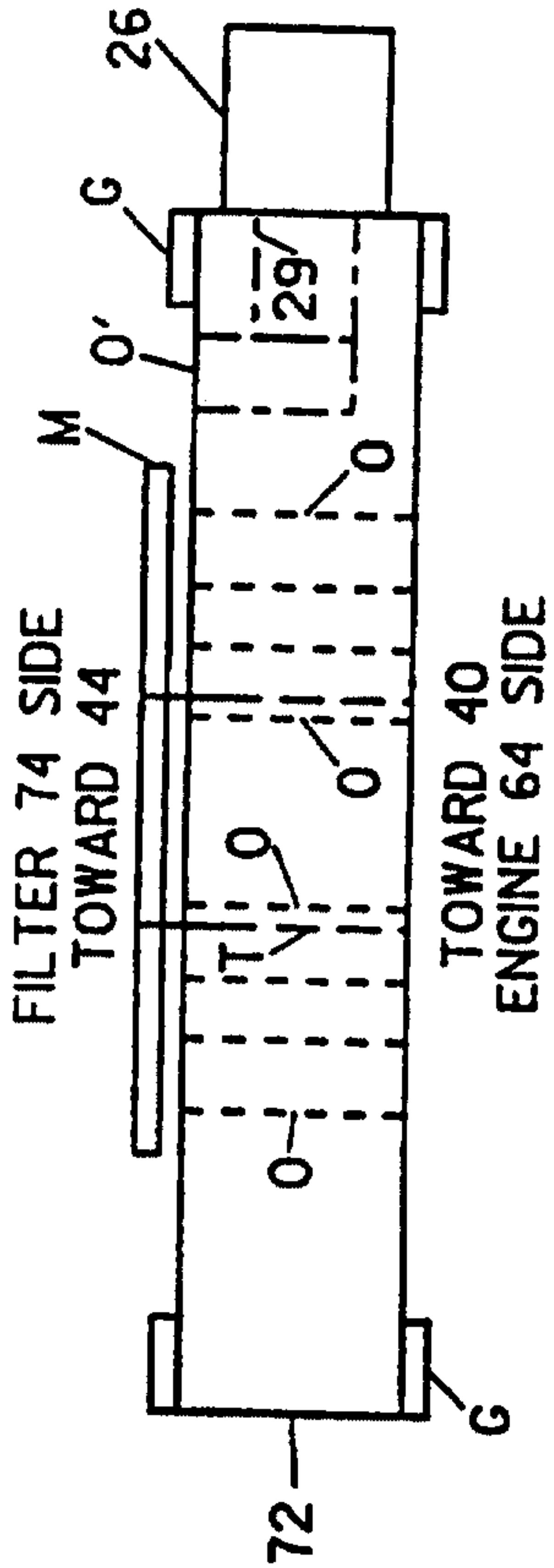
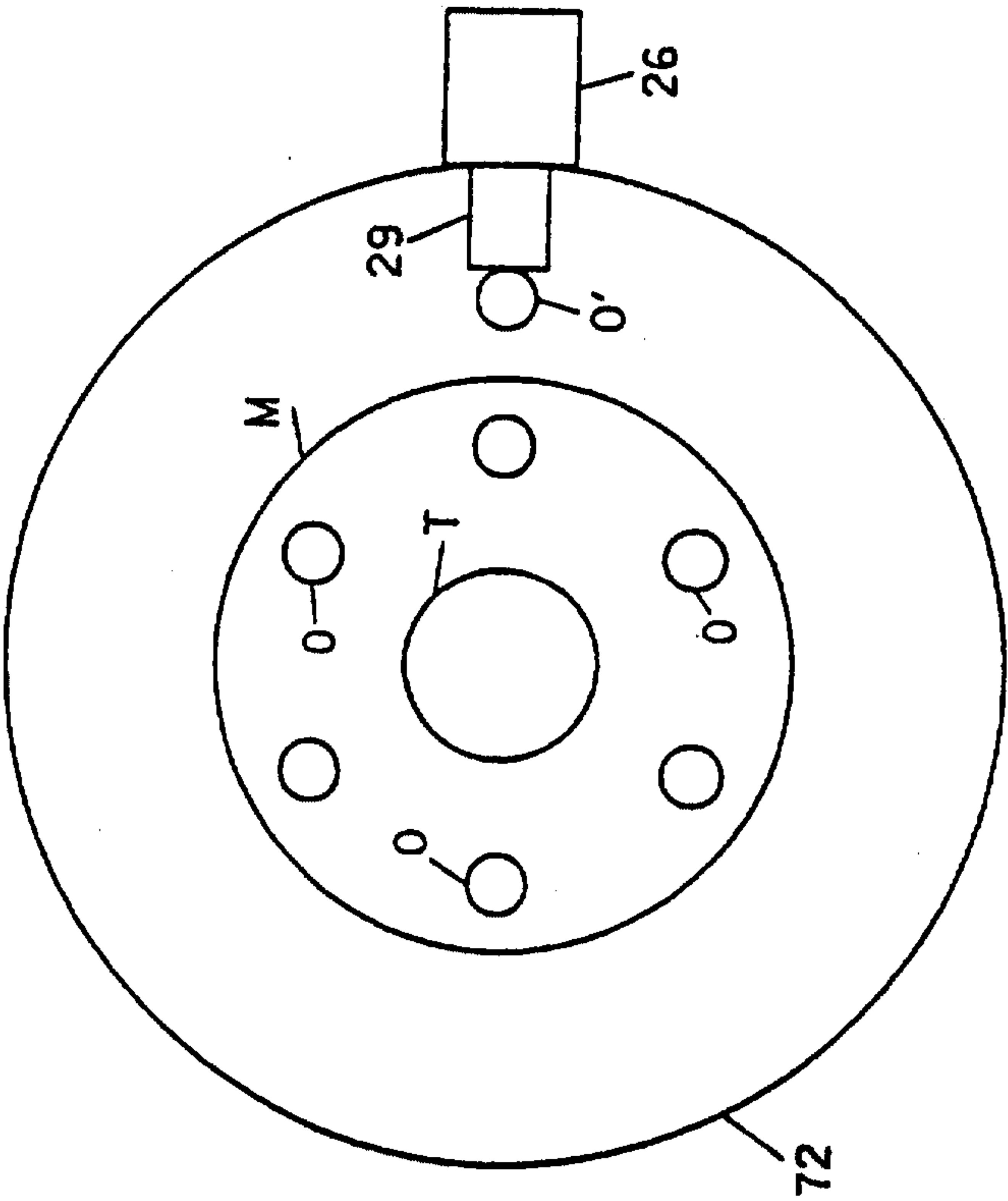


FIG. 5B
GROUP 4