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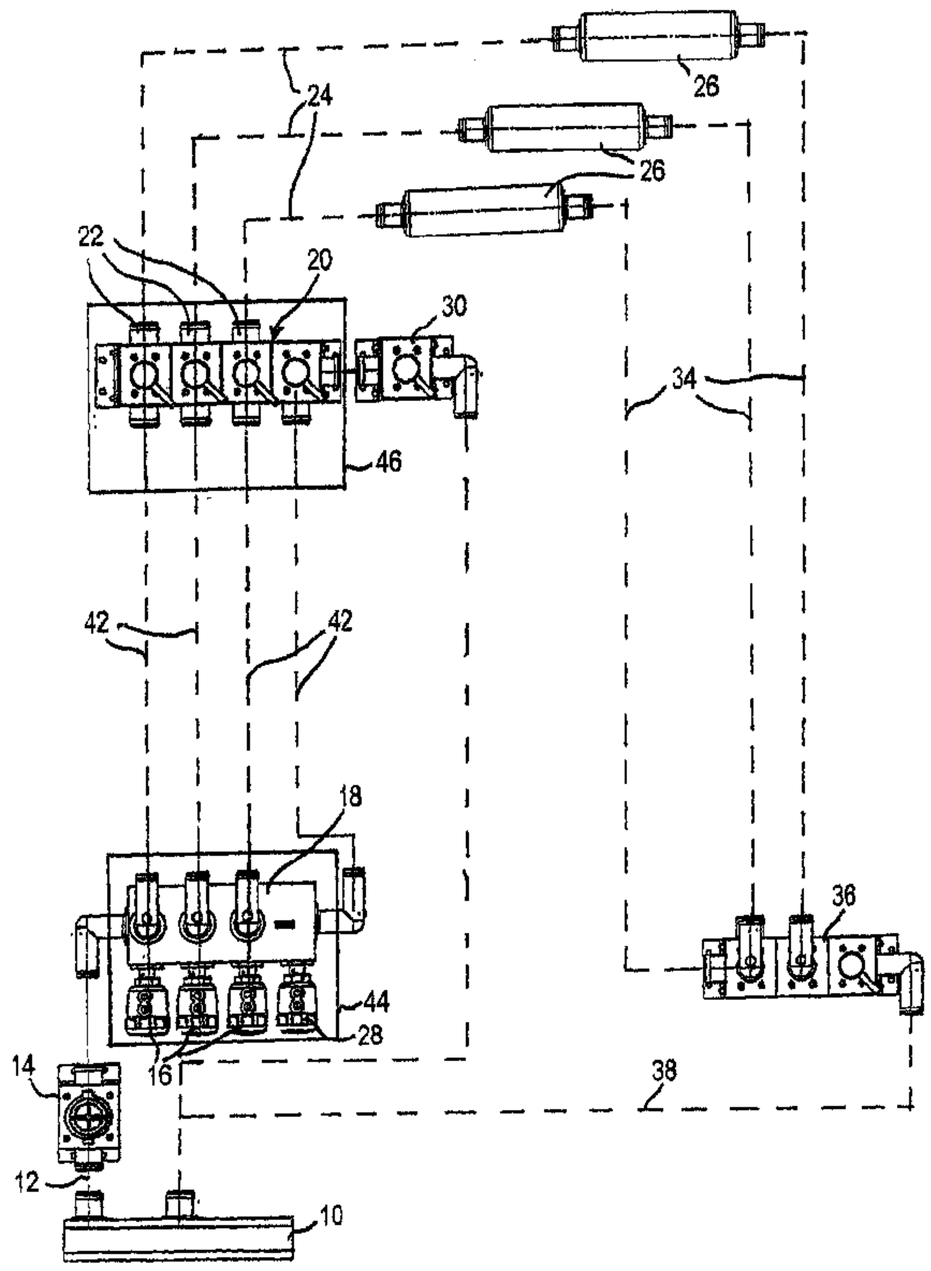
(54) Titre : SYSTEME DE CHAUFFAGE/REFROIDISSEMENT AVEC PLUSIEURS CIRCUITS CONSOMMATEURS SEPARES, EN PARTICULIER POUR DES VEHICULES UTILITAIRES

(54) Title: HEATING/COOLING SYSTEM HAVING A PLURALITY OF SEPARATE CONSUMER CIRCUITS, PARTICULARLY FOR COMMERCIAL VEHICLES



(57) Abrégé/Abstract:
The invention relates to a heating/cooling system, particularly for vehicles, having a plurality of separate heating/cooling circuits in which a heat carrier medium can circulate. The system comprises a feed line, a control valve, a heat exchanger for each

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(57) Abrégé(suite)/Abstract(continued):
heating/cooling circuit, a collector in which the heat carrier medium returning from the heat exchangers can be collected, and a return line. The control valves are combined in a control valve block. The amount of heat carrier medium circulating in each heating/cooling circuit can be influenced by the control valves. The collector and the control valve block form individual units that can be arranged in a spatially separated way from each other. The control valve block is thermally separated from the collector.

Abstract

The invention relates to a heating/cooling system, particularly for vehicles, having a plurality of separate heating/cooling circuits in which a heat carrier medium can circulate. The system comprises a feed line, a control valve, a heat exchanger for each heating/cooling circuit, a collector in which the heat carrier medium returning from the heat exchangers can be collected, and a return line. The control valves are combined in a control valve block. The amount of heat carrier medium circulating in each heating/cooling circuit can be influenced by the control valves. The collector and the control valve block form individual units that can be arranged in a spatially separated way from each other. The control valve block is thermally separated from the collector.

Heating/Cooling System Having a Plurality of Separate Consumer Circuits, Particularly for Commercial Vehicles

The present invention relates to a heating/cooling system having a plurality of separate consumer circuits, in particular for commercial vehicles.

In systems of this type, the distribution of the heat transfer medium (e.g., water or a water/glycol mixture) into the various circuits is effected with the aid of valves arranged in the various heating or cooling circuits supplied. The heat transfer medium then flows into heat exchangers in which a heat exchange takes place. In heating/cooling systems according to the prior art, there is no separation of the different sections, neither according to temperature nor according to function. In particular, collectors for collecting the heat transfer medium after it has flowed through the heat exchangers and for conveying it into the return line are frequently arranged in immediate proximity to the control valves in the supply line. EP 1 441 160 B1, for example, discloses the combination of the collector and the control valves in the supply line in a block. As a result, in the case of a heating circuit the hot heat transfer medium is in the immediate vicinity of the cooled-down heat transfer medium.

Commercial vehicles that may have a heating/cooling system including a plurality of separate consumer circuits are refrigerated trucks, for example, which have a refrigerated cargo space and may also have an air-conditioned driver's cab, but also motor-coaches. Modern motor-coaches have a large number of heating and cooling circuits for a ceiling heating, a floor heating, with heating circuits for the front and the rear of the bus, all of which can be controlled separately, preferably centrally at one location. In commercial vehicles such as, e.g., the motor-coaches mentioned above, there are very limited options for installing pipe systems for conveying a heat transfer medium. When the heating/cooling system dictates that the lines leading to the heat exchangers start at the same point at which the lines leading back from the heat exchangers terminate, namely in a common valve block, the lines that convey hot water will be situated in the immediate spatial vicinity of those lines that convey the cold

water flowing back from the heat exchanger, so that undesirable interactions will occur.

Also in case that servicing is required, it is a drawback that the different functional areas such as, for instance, collector or distributor, are not separate from each other. In case of repair, the confusing situation in the entire piping system of such systems constitutes an increased risk of error and even a source of danger. In the prior art, the connections for pipes leading to heat exchangers are arranged in the same block as the connections for pipes leading back from the heat exchangers. In the cramped installation conditions in a vehicle, any markings on the valve block may not be particularly easy to recognize.

In addition, the usual unstructured construction results in long service times.

In an embodiment, there is provided a heating/cooling system, in particular for vehicles, having a plurality of separate heating/cooling circuits in which a heat transfer medium can circulate, comprising a supply line; one control valve for each heating/cooling circuit, which can be used for controlling the amount of heat transfer medium circulating in the heating/cooling circuit; one heat exchanger for each heating/cooling circuit; a collector in which the heat transfer medium flowing back from the heat exchangers can be collected; and a return line, wherein the control valves are combined in a control valve block, the collector and the control valve block each constitute an independent unit that can be arranged spatially separated from the other unit, and the control valve block is thermally separated from the collector.

As disclosed a heating/cooling system in which the components are separated from each other both according to temperature ranges and according to functional areas and also according to the direction of flow.

The control valves for the individual heating/cooling circuits may be combined in a control valve block, and the collector and the control valve block each constitute independent units that can be arranged so as to be spatially separate from each other. The control valve block is furthermore thermally separated from the collector. The spatial separation also, naturally, results in an arrangement of lines without any neighboring pipes between which large temperature differences may exist. Any

undesirable interaction between the hot and the cold heat transfer medium no longer occurs, which increases the efficiency of the system.

The functional areas may be divided into the actuator level for controlling, the service level with shut-off modules as distributors, the consumer level with heat exchangers, and the collector level with nonreturn valve modules, by means of which the heat transfer medium is recirculated to the return line (e.g., water into the engine compartment of the vehicle).

Optionally, hot water may be directly recirculated to the engine compartment via a bypass.

In a further exemplary embodiment, the valve block additionally has a pump integrated therein, which provides the necessary pressure for the water in the heating/cooling circuit.

Further features will be apparent from the description of preferred embodiments, which is based on the accompanying figures, in which:

- Figure 1 illustrates the structure of a first embodiment of the entire heating/ cooling system; and

- Figure 2 illustrates the structure of a second embodiment of the entire heating/cooling system.

For a simplified description, a heating system will be discussed below; a cooling system is constructed analogously thereto.

Figure 1 schematically illustrates a heating system, for example for a coach. Heated water is conveyed from an engine 10 via a supply line 12 to a filter module 14. The use of the filter module 14 is of advantage because in this way any dirt particles that may have been brought in are removed from the circuit so as to make sure a perfect functioning of the valves arranged downstream.

Control valves 16 for different consumer circuits, i.e. different heating circuits, are combined in a control valve block 18. Filtered water or, more generally, a filtered heat transfer medium is conveyed to a distributor 20 by means of the control valve block

18. The distributor 20 is composed of a plurality of shut-off modules 22 and constitutes a shut-off module block 20. The shut-off modules are each separated from each other by a bulkhead.

Pipes 24 lead from the shut-off module block 20 to heat exchangers 26. The pipes 24 are illustrated in broken lines. This is intended to show that they can have different lengths and can be arranged so as to be completely separate from each other.

The heat exchangers 26 can each be switched off separately by means of the shut-off modules 22 of the distributor 20. The amount of heat transfer medium circulating in each heating circuit can be controlled by means of the control valves 16 of the control valve block 18.

As a result, one control valve each for feeding one respective heat exchanger 26 is situated in the control valve block 18 for controlling the temperature in the various areas such as driver's cab heating or roof heating. A further control valve 28 in the control valve block 18 serves for a bypass control. The bypass leads from the control valve block 18 directly back to the engine 10 via a shut-off module 30 of the distributor 20. Downstream of the filter module 14, a circulation pump 32 is schematically indicated in Figure 1, which ensures the circulation of the heat transfer medium. This pump is advantageously integrated in the control valve block 18, but it may, of course, also be inserted in the return line.

The water passes through pipes 24 to the respective heat exchanger 26 of the area for which the correct temperature is desired and then, having been cooled down, flows through pipes 34 to a collector 36 and from there through a return line 38 and back to the engine compartment with the engine 10. The pipes 34 are also illustrated in broken lines; they may have different lengths and be guided along different paths.

Integrated in the collector 36 are nonreturn valves for preventing water from the area of lower temperature from flowing back to the heat exchangers 26.

The control valve block 18, the shut-off module block 20, and the collector 36 constitute independent components which may be arranged to be spatially separate from one another. In the embodiment according to Figure 1, the control valve block 18 and the shut-off module block 20, both of which carry hot water, are arranged in a neighboring relationship and thermally separated from the collector 36 by means of a schematically illustrated insulation 40. The thermal insulation can be obtained by a sheathing or encapsulation, but also by a suitable selection of the site of installation, i.e. in the form of a sufficient spatial distance from the collector 36. The combination of the control valve block 18 and the shut-off module block 20 has the advantage that the two blocks which allow a controlling intervention in the heating/cooling system may be arranged close to each other and within easy reach for the driver.

When the control valve block 18 and the shut-off module block 20 are installed on the left-hand side of the coach and the collector 36 on the right-hand side of the coach, for example, the pipes 24 carrying hot water can at first be guided on the left side and then to the respective heat exchangers, and the pipes

34 leaving the heat exchangers and carrying cold water are at first guided to the right-hand side of the coach and from there then to the collector 36. This avoids, for one thing, that pipes 24 and pipes 34 lie side by side over longer distances and a heat exchange takes place and, for another thing, it becomes significantly less likely that pipes 24 are confused with pipes 34 during servicing. Of course, other separated installation sites (top - bottom; front - rear) are also conceivable, which depend on the circumstances in the commercial vehicle concerned.

It will be appreciated that the invention is not limited to a use in commercial vehicles; the separation into functional blocks allows an especially clear installation in other heating and cooling systems as well.

Figure 2 shows essentially the same heating system as Figure 1; like components are denoted by the same reference numbers and will not be discussed again. In contrast to Figure 1, the control valve block 18 and the shut-off module block 20 are also distinctly separated from each other here and are connected with each other by pipes 42. Separate encapsulations 44 and 46 are indicated for a thermal separation from the collector 36. In the exemplary embodiment illustrated in Figure 2, the shut-off module 30, which is associated with the bypass circuit, is not part of the shut-off module block 20 and is not covered by the thermal encapsulation. Owing to the further division into functional blocks, the heating system according to Figure 2 is even more flexible to install, with the thermal separation between the parts carrying hot water and the parts carrying cold water being maintained.

Claims

1. A heating/cooling system, in particular for vehicles, having a plurality of separate heating/cooling circuits in which a heat transfer medium can circulate, comprising

a supply line;

one control valve for each heating/cooling circuit, which can be used for controlling the amount of heat transfer medium circulating in the heating/cooling circuit;

one heat exchanger for each heating/cooling circuit;

a collector in which the heat transfer medium flowing back from the heat exchangers can be collected; and

a return line, wherein

the control valves are combined in a control valve block, the collector and the control valve block each constitute an independent unit that can be arranged spatially separated from the other unit, and the control valve block is thermally separated from the collector.

2. The heating/cooling system according to claim 1, wherein the thermal separation is obtained by a spatial separation and/or an insulation of the control valve block in the form of a sheathing or encapsulation.

3. The heating/cooling system according to claim 1 or 2, further comprising

a shut-off module for each heating/cooling circuit, wherein the shut-off modules are combined in a shut-off module block and can be arranged spatially separately as an independent unit between the control valve block and the heat exchangers.

4. The heating/cooling system according to claim 3, wherein the shut-off module block is thermally separated from the collector.

5. The heating/cooling system according to claim 1, wherein a filter is arranged in the supply line so as to be spatially separated from the control valve block.

6. The heating/cooling system according to claim 1, wherein the control valve block includes a bypass control valve having an outlet connected to an inlet of a bypass shut-off module of the shut-off module block having an outlet directly connected with the return line.

7. The heating/cooling system according to claim 1, wherein the heat transfer medium is circulated by means of a circulation pump.

8. The heating/cooling system according to claim 7, wherein the circulation pump is integrated in the control valve block.

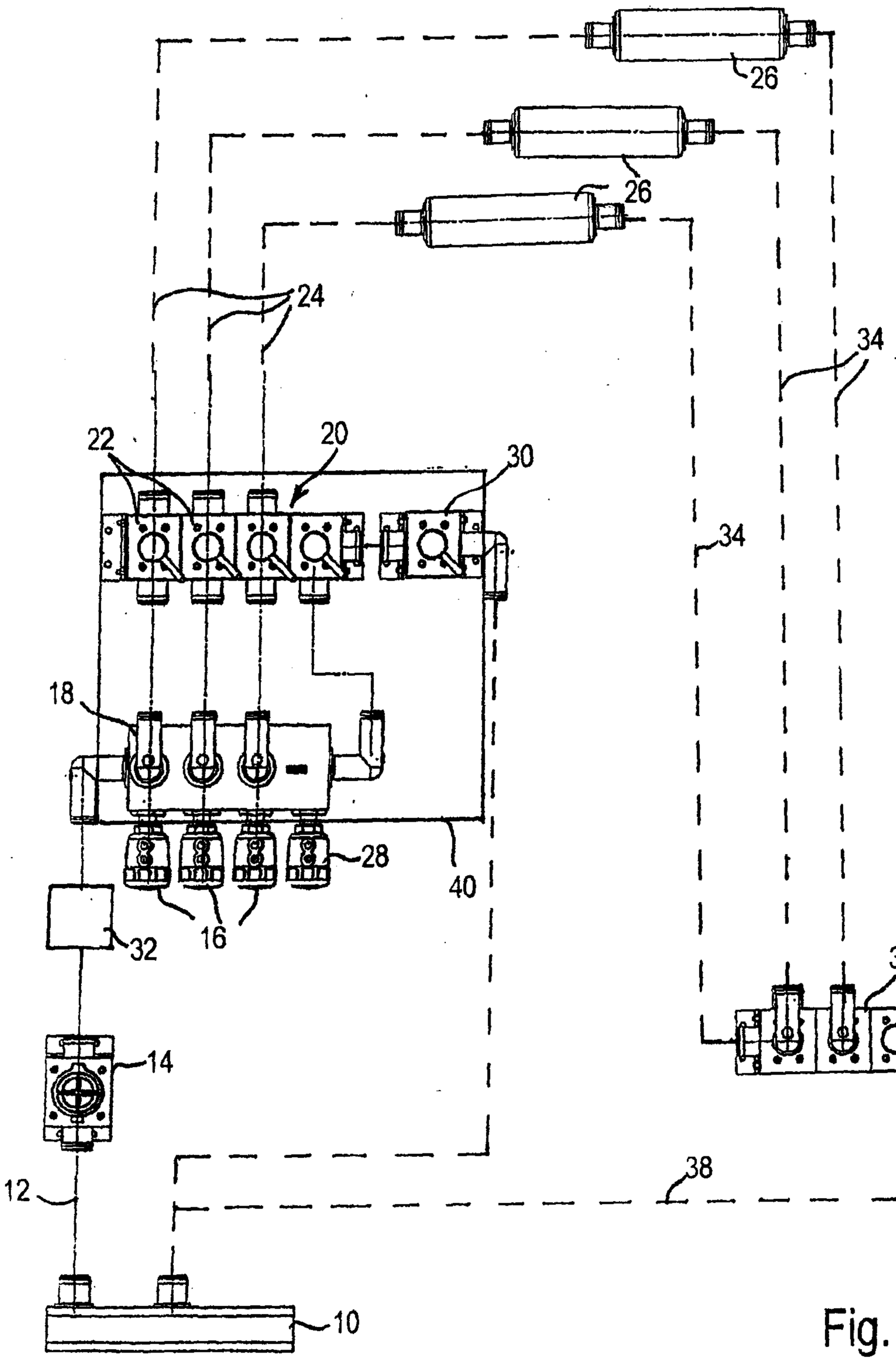

Fig. 1

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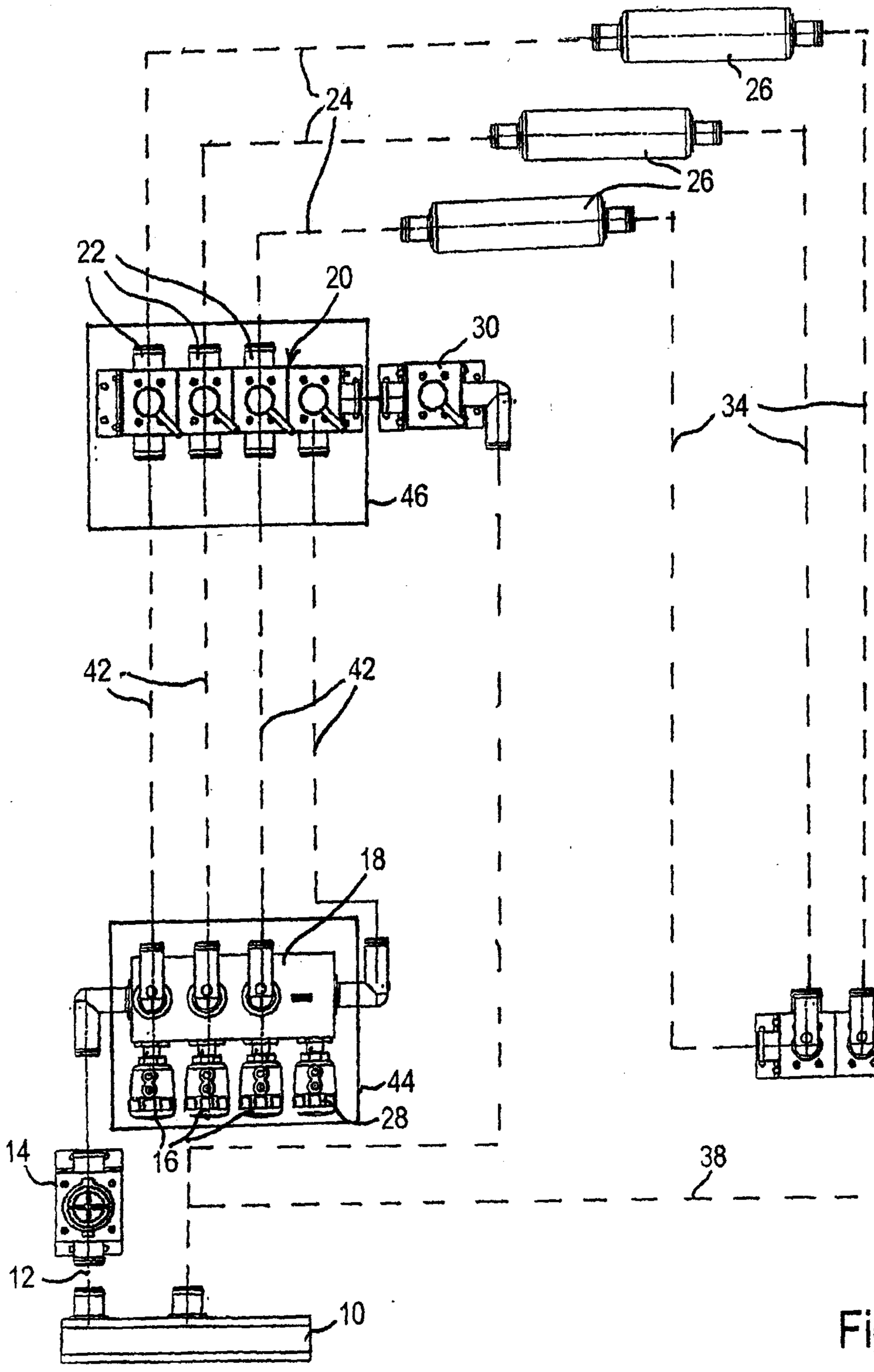

Fig. 2

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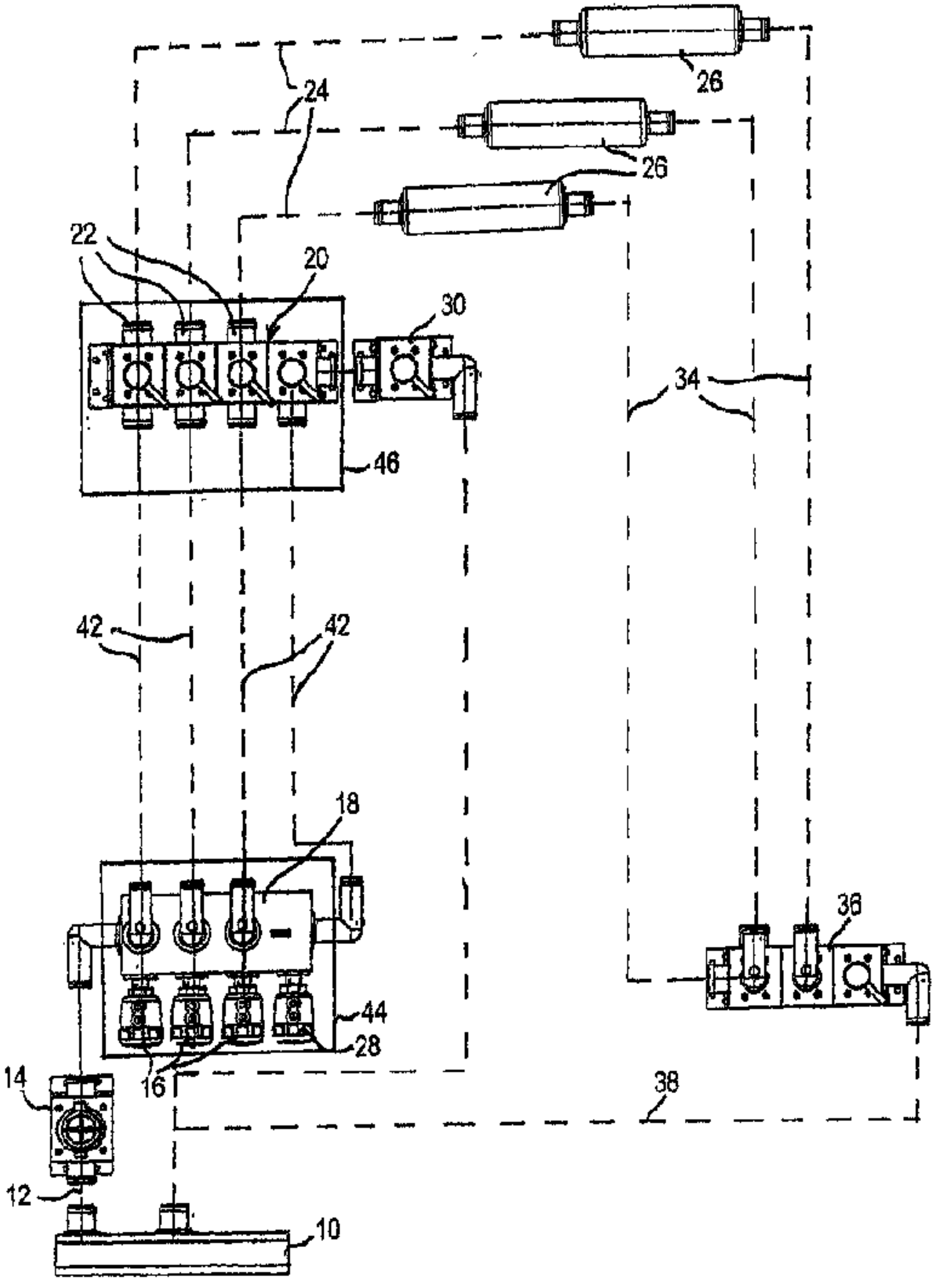
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