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Description

This invention concerns domestic hot water storage cylinders and heating systems incorporating such cylinders.

The principle of heating water for domestic purposes has in the majority of residences become merged with heating the rooms by water-filled radiators by a single heat source. The medium of water serves to heat both (1) the domestic hot water, and (2) the central heating radiators. It is necessary to keep the water in these services physically separate by e.g. means of a heat exchange device. The water in the domestic services is to be kept clean and uncontaminated by the normally dirty radiator water. Similarly the central heating water should be kept inert and unaffected by dissolved air normally present in the domestic water services.

The principle of physical separation of these water services is well known and largely attained by having two independent water services served by a single heat source and connected for the transfer of heat from one to another by a heat exchanger. Contemporary practice is founded on heating the domestic hot water supply in a storage container. This is referred to as an 'indirect' cylinder, the bulk of stored water being heated, in use, by a heat exchanger coil (although other forms may be found) which is connected to the primary central heating system, both services being heated by one central boiler.

This contemporary practice has the disadvantage that two separate water systems leads to duplication of technical components and a consequent higher cost. The traditional method in the United Kingdom is based on both domestic hot water and the central heating water services requiring a separate high level cold water supply cistern and each with its own mains input supply, overflow discharge pipe, feed connecting pipe and open vent safety pipe.

GB-A-2 001 740 provided a system for avoiding this duplication so that one set of services could be utilised for both (1) the domestic hot water, and (2) the central heating system.

The patented system relies upon dissolved air naturally found in water and its release upon heating. The air is collected in a vessel to keep the secondary domestic water separate from the primary central heating water.

There exists a demand towards 'unvented' domestic heating systems in which the intermediate storage cistern within the domestic residence is eliminated and the public reservoir is used instead as a direct feed supply to the hot water system.

In 'unvented' systems the domestic hot water services are no longer supplied from a high level

cold water storage cistern, which has an open vent to atmosphere. As unvented systems do not have an open vent it is necessary to introduce safety measures or devices, if not sold with the cylinder then certainly prior to actual operation, to make the system safe and to accommodate normal operation and malfunction.

Domestic hot water storage and central heating systems may now require (a) an inlet water pressure regulating valve, (b) a pressure relief valve, and (c) a temperature relief valve (preferably including an anti-vacuum function). These principal safety controls can be supplemented by an expansion vessel to accommodate thermal expansion and/or contraction of the bulk of stored hot water as it heats and cools.

Such mechanical safety controls form part of the unvented domestic hot water system, the primary central heating system being physically and mechanically separate.

The 'sealed' central heating system has been in use in this country for some time with certain drawbacks. This type of system, because it has no open vent to atmosphere, requires an expansion vessel to accommodate expansion and contraction of the primary heating system. Pressure exerted within the primary system seeks out the weakest points of minor leakage, e.g. the packing gland of radiator valves. The sealed system hitherto used does not have a permanent facility for replenishing lost water. The primary system only has to lose a 'cup' of water per week to be a failure.

If the unvented domestic water heating system were to be used together with the sealed central heating system this would involve duplication of all the mechanical safety control devices previously described.

The present invention seeks to provide a cylinder and system in which the unvented domestic hot water system can be combined with the sealed central heating system. The mechanical safety control mechanisms may serve both services with savings in cost and service maintenance.

According to this invention there is provided a domestic hot water cylinder for use with a sealed central heating (CH) system and an unvented hot water (HW) system supplied with water from a regulated pressure source, characterised in that in an upright position the cylinder is in the form of a self-contained enclosed fluid containment vessel internally defining a first volume forming an indirect HW cylinder and integral expansion tank and having a header region for storing air surmounting a region for storing water, the water storing region incorporating heater means for heating stored water and for thereby releasing dissolved air from said water whereby to fill the header region with air, first upper port means adjacent the top of the water

storing region for delivering stored fluid to the exterior of the vessel and second lower port means remote from the top of the water storing region for receiving water to be stored from the exterior of the vessel;

a second volume forming a CH system expansion tank and having a header region for storing air surmounting a region for storing water, said second volume comprising an auto air vent means arranged to enable venting of the second volume to the exterior of the vessel when the stored water level in the second volume is less than a set level, the water storing region comprising port means for transmitting CH system fluid to and from the exterior of the vessel;

the arrangement of said first and second volumes being such that each header region has a predetermined volumetric capacity which is greater than that required to accommodate thermal expansion of water from the pertaining water storing region; and a fluid transmitting passageway extends between said first and second volumes said passageway opening into the respective header regions at a level which is above that attained by thermal water expansion from the pertaining water storing region.

This invention eliminates the need for a separate expansion vessel by providing integral volumes or chambers for accommodating expansion and contraction of both the domestic store of hot water, and also the primary central heating system. The invention may provide 'make-up' water to the primary heating system which may be required from e.g. minor leakages. The invention may allow the pressure exerted on both the domestic stored water and the primary heating circuits to be equal. Both services may be influenced equally by the pressure entering from the street mains through a pressure reducing valve. This valve may be pre-set at any required in-put pressure, e.g. 0.45 BAR (4.5×10^4 Newtons per square metre).

This operating pressure will enable a normal BSS 1566 GRADE 3 copper hot water cylinder to be utilised as the main storage cylinder, with cost savings. The pressure relief valve when fitted to the cylinder may be set at any required break pressure, e.g. only 1 BAR (10^5 Newtons per square metre). In practice this means that the normal operating pressure on both the domestic hot water service and also the central heating system would be equivalent to an ordinary two storey house, traditionally with a high level storage cistern in the attic. The invention is designed to exploit the release of 'dissolved air' naturally found in water and to use this as a functional component. The invention may render the primary system inert, removing the dissolved air from the central heating system, and maintaining such status. The release of dis-

solved air from the secondary hot water storage is considerable being some 2% of water volume. In practice this means there is about 2.25 litres ($\frac{1}{2}$ gallon) of dissolved air in every 112.5 litres (25 gallons) of stored hot water. This means that there is in normal use a constant rejuvenatory discharge of dissolved air from the domestic stored hot water into the functional air collecting header region(s).

In embodiments of the present invention the physical volume of the vessel capable of maintaining an air seal is substantially enhanced compared to the system described in GB-A-2 001 740 at minimal cost insofar as the second volume may be defined by a transverse partitioning walls through which at least one duct extends allowing communication between parts of the water storing region of the first volume located above and below the second volume, and the upper and lower chambers so formed can be simply provided as a short extension of the relatively large diameter cylinder normally used for conventional hot water storage systems.

Suitable cylinders for use in the present invention include, for example, a standard BSS1566 Indirect Cylinder, or BSS699 Direct Cylinder. It will be appreciated from the following detailed description of a preferred embodiment, that the upper part of a standard hot water cylinder can be modified so as to provide the air collecting header volume(s).

In order that the invention may be illustrated and readily carried into effect, an embodiment thereof applied to an indirect cylinder will now be described by way of example only with reference to the accompanying drawings, in which;

Figure 1 is a sectional view of a domestic cylinder showing selected internal and external features;

Figure 2 is a partly cut-away corresponding view showing further external fittings; and

Figure 3 illustrates the cylinder and chambers containing water during initial priming or use.

Referring to Figures 1 and 2 of the drawings which show part of an 'unvented' domestic hot water storage and central heating system, the storage cylinder 1 is fed by direct mains through stop valve 20 and strainer 19 to pressure regulating valve 13.

The pressure reducing valve can be pre-set to the required out-put pressure. This is followed by a cold water supply outlet 17 which has the advantage of equalizing the input pressure to both the hot and cold household supply - with a resulting advantage in the function of these services, particularly the operation of a hot and cold shower. Just before entering the normal cold feed supply point 15 in the hot storage cylinder 1, there is positioned a non-return valve 14. This is to prevent back-pressure into the main supply, which would result

from expansion of the stored hot water during heating.

The bulk of the hot water is contained within the storage cylinder compartment "A". Constructed integrally within the upper interior of the cylinder are the two adjacent chambers - the lower serving as the primary expansion chamber "B", the upper expansion chamber "C" serving as secondary domestic supply service. Lower chamber "B" is defined by the cylinder space contained between base 2 extending the full internal width of the cylinder and partitioning wall 3 also extending the full width of the cylinder 1. The upper chamber "C" is defined by the cylinder space between partitioning wall 3 and the internal roof 4, comprising a conventional domed top. The chambers are in communication but in a manner to separate the primary central heating water from the secondary 'draw-off' hot water supply, the internal pressure on both sides of these 'separating' chambers being equal, and not requiring to sustain any pressure differential between them.

The whole of the hot water storage vessel is contained within the cylinder 1. This will usually be constructed to the pressure requirements of BS1566 or BSS699 - in accordance with the grade calling for respective operating pressure. The main water storage chamber or compartment "A" is in communication with the upper chamber "C" by means of a secondary duct 5, which transcommunicates from compartment "A" to chamber "C", without communicating with the intervening lower chamber "B".

A primary duct 6 extends upwardly from the partitioning wall 3 to open communication with the top of chamber "C" and spaced from the roof 4. A further secondary duct 7 extends downwardly from the partitioning wall 3 through chamber "B" but not in communication therewith towards the cylinder base within main storage compartment "A".

The upper chamber "C" provides the domestic hot water storage/supply, being intercommunicated through duct which is an open tube, to the main (domestic) storage compartment "A". This upper chamber provides a hot water draw-off 8 at a point adjacent the partitioning wall to the household fittings. There is also on the same horizontal plane towards the bottom of chamber "C" a pressure relief valve 9 incorporating an external discharge pipe and preferably also an anti-vacuum device.

Also on this horizontal plane can be provided an automatic air vent 9a of the type commercially available under the Trade Mark "Purg-O-Mat", which will release any surplus of dissolved air accumulated in chamber "C" which is not otherwise discharged through the hot water draw-off 8.

Chamber "B" provides primary central heating supply. Adjacent base 2 is the connection 10 suit-

able for primary heating circuit, see Figure 2. Also on the same horizontal plane adjacent base 2 is an automatic air vent 11, for example, the type sold under the Trade Mark "Purg-O-Mat" formed and arranged for automatic closing by the rising water after completion of venting. Towards the top of compartment "A" there is a temperature and pressure relief valve 12, incorporating an anti-vacuum function and external discharge pipe.

A coiled copper tubular heat exchanger is shown at 16 (Figure 1) for connection to the primary heating circuit, incorporating pump 18 (Figure 2), boiler flow line "F", boiler return line "G", heating flow line "D" and heating return line "E".

The filling and operation of the system is described with reference to Figures 1 and 3. Water enters the cylinder compartment "A" by way of the cold feed inlet 15 at the bottom, being connected from pressurized street mains, and passes through the stop valve 20, strainer 19, pressure regulating valve 13 pre-set to a pressure acceptable to the primary and secondary circuits, and the non-return valve 14. The pressure reduced cold water enters the main storage compartment "A" and proceeds to fill the entire cylinder and the major part of upper chamber "C". The auto-air vent 11 in chamber "B" is wide open as is also the air vent 9a in chamber "C", so that as cold water enters the storage cylinder air is automatically expelled. Compartment "A" continues to fill and the water rises through secondary duct 5 into chamber "C". The air vent 11 continues to vent air and the water level in chamber "C" rises until it reaches the top of the primary duct 6, the automatic air vent 9a having been closed by the water level rising above it. This water then spills over this tube 6 and pours into the lower (primary water) chamber "B". The water in the primary storage vessel "B" continues to fill, and water from this pour through the primary connection 10 to fill the entire primary central heating system, which includes the boiler and radiator system (not shown). The primary heating system continues to fill while the automatic air vent 11 continues to expel air. Eventually the water fills the entire primary system and the water level then rises in the primary chamber "B", so that water then enters the auto-vent 11 raising the automatic air vent float control and so preventing further air expulsion. The instant the auto-vent closes the water which was pouring over the primary duct 6 from "C" stops at the lip of this duct, having trapped atmospheric air in chamber "B" from the water level set by the auto-vent. Air is trapped in (i) chamber "B", from this water level to the partitioning wall 3, in (ii) the primary duct 6, and (iii) above the end of this duct to the cylinder roof 4. The level of the domestic stored water in chamber "C", at this stage, is at the said top of the primary duct 6.

The entire system is then ready for normal operation, and the boiler can be switched on enabling the primary circuit to heat up. Before doing this, however, the chamber "C" can be primed with atmospheric air by a manual process, e.g. the cold water control stop valve from the street mains is temporarily turned off. The pressure release valve 9 in "C" is then manually opened, being fitted with a manual operating level for this purpose. The water in "C" then drains out through the discharge pipe attached to the pressure relief valve, while simultaneously the anti-vacuum valve opens and draws atmospheric air into "C". Once chamber "C" is fully primed with atmospheric air the street mains control stop valve can then be turned on. The effect of this manual action is to artificially fill the upper section of "C" with a cushion of air. This atmospheric air which has been trapped in the upper portion of the chamber is compressed to the pressure set by the incoming reduced-pressure mains water supply. It should be noted that chamber "C" is designed to accumulate air expelled from the water which would otherwise be continually present in the stored domestic hot water in compartment "A". As this stored hot water is continually heated and replaced there is a continuous release of dissolved air which rises by its own bouyancy from compartment "A", and passes through the secondary duct 5 into "C". The accumulation of this air in "C", together with the previously 'trapped' atmospheric air in the lower chamber "B", is important to functional operation.

Air is compressible, and this acts as an air cushion, to accommodate the expansion and contraction in both the primary and secondary water systems. The physical size of chambers "B" and "C" can be varied by an accommodation in the height of the cylinder wall. The diameters correspond to that of the cylinder itself. The actual dimensions can be determined by an assessment of the amount of expansion volume which will result from heating both the primary central heating system, and also the stored domestic hot water in compartment "A". It has been assessed that both the primary and secondary water volumes have to allow for an increase in volume due to heating of some 4% of volume. Since air is compressible, while water is not, it is therefore a function of the air cushion in both chambers "B" and "C" to accommodate this expansion in volume. An assessment required to be made to take account of all modes of operation. For the purposes of example, the pressure relief valve 9 in "C" is set to open when the pressure reaches 10 psi (7.1×10^4 Newtons per square metre). Similarly the temperature and pressure relief valve 12 is set to open at a slightly higher pressure of 12 psi (8.6×10^4 Newtons per square metre). It will be observed that

both these relief valves are set to operate at a pressure slightly below the maximum pressure required by the grade of cylinder for normal operation (i.e. - BSS1566 - Grade 3 = 10^5 Newtons per square metre).

The normal mode of operation would assume that when the boiler starts to heat, the primary central heating system, including the radiators, will heat and expand first. Shortly afterwards heat transferred through the primary heating coil in the indirect cylinder will begin to heat and expand the secondary stored water. Immediately the domestic hot water draw-off tap at the household fittings was used this would instantly relieve and equalize all expansion pressure within the storage vessel. For the purpose of assessment, however, it should be assumed that during the initial mode of operation this draw-off tap will not be used. The primary central heating water, which is the content of the boiler, the primary pipe-work, and the radiators will expand, upon heating, some 4% of volume. The size of the primary chamber "B" can accommodate such volumetric expansion. As the primary water heats the water level previously set by the auto-vent 11 rises in chamber "B" and pushes the air previously trapped therein upwards, through the primary duct 6 into chamber "C". This air is compressed in proportion to the primary system volumetric expansion and taking account of its initial volumetric capacity. it should be noted the air content already accumulated in chamber "C" had previously been manually increased

After a delay in time the primary heating coil in "A" will heat the stored domestic hot water, and depending upon the initial stored volume of the cylinder, will also expand some 4% of volume. It would be possible to design the communicating air cushions to accommodate the maximum expansion of both the primary and secondary water simultaneously. However, since normal domestic applications run the draw-off to the household taps, this immediately relieves and equalizes the internal pressure due to expansion of both systems. Minor relief of pressure through the pressure relief valve 9 under maximum operational mode may be permitted. There are two pressure relief valves in the embodiment described since manual relief valves can stick in the closed position when they are only infrequently actuated.

In a normal operational mode, both the primary and secondary water is free to expand and contract as it heats and cools. The physical size of chamber "B" can be sufficient to permit expansion and contraction of even the largest primary central heating system, without fear of inter-mixing primary water with secondary storage supply. Similarly the stored domestic hot water is free to expand and contract as it heats and cools, and there is a

continual release of dissolved air from the water in cylinder compartment "A" as this water is heated. It is estimated that some 2% of the volume of cold water from the street mains is dissolved air, and this is released by the act of heating the water. By its normal bouyancy this dissolved air accumulates in chamber "C". Eventually this chamber provides an optimum air cushion and any surplus of air is discharged mildly through the draw-off outlet to the taps upon opening of these, or released through the automatic air vent 9a. Should both, or either, of the primary or secondary water systems be in a fully heated state and at maximum expansion, then upon the boiler being switched off allowing the systems to cool and contract, the anti-vacuum function preferably in both pressure relief valves comes into operation. Upon the volume in the main compartment contracting, the anti-vacuum valves open and admit atmospheric air to the cylinder, thus enhancing the air-cushion. The normal mode of operation of the system is to continually maintain and enhance this air cushion. The water to air interface of the primary central heating water system within "B" is free to rise and fall therein, without agitation of this interface, as the primary water heats and cools, and surprisingly it has been found that oxygenated air cannot enter the primary water system through this interface.

A supplementary function is attributed to the further secondary duct 7 as shown in Figure 1 or 3. This duct is to induce natural convection flow through the other secondary duct to ensure the hottest water is always available in the upper chamber "C", where it can then be drawn-off to the household taps.

It is equally important to consider any possible malfunction of the system. In the event of failure of the incoming pressure regulating valve 13, allowing mains pressure to bear upon the storage cylinder, there are two pressure relief valves to accommodate this, the upper valve 9 set to open at e.g. 10 psi (7.1×10^4 Newtons per square meter), and the lower valve 12 set to open at 12 psi (8.6×10^4 Newtons per square metre). Under malfunction consideration should be given to an event such as the boiler 'boiling'. Although normally the present system would be fitted with a 'protected' boiler, i.e. a boiler fitted with a 'high-limit thermostat, if excess pressure caused an accidental 'boiling' of the boiler, this excess pressure should be relieved through either of the two pressure relief valves 9 and 12, both of which are independently discharged outside to atmosphere.

Once the cause of malfunction was corrected, the air seal within the chambees would automatically re-establish, to restore operation to normal mode. The tempeature and pressure relief valve 12 in compartment "A" can take account of the need to

relieve pressures which could result from temperature increases beyond pre-set level. This could occur by failure of an electrical immersion heater fitted with an automatic thermostat. This relief valve 12 will open on both temperature and pressure malfunction.

Figure 2 shows a substantial part of a domestic hot water storage and central heating system according to the invention. It can be seen that one set of pressure regulating the relief valves may serve both the domestic hot water services and the central heating system simultaneously with resulting saving in costs.

The Figures 1 to 3 illustrate how a standard BSS1566 indirect cylinder, manufactured to normal dimensions, and founded on a diameter of 450mm will have a height which is the standard height plus 350mm, which is accounted for by the assessed physical dimension and height of both chambers "B" and "C". This design criteria may apply to all BSS Copper Cylinders of 450mm diameter. It will be possible to construct cylinders and systems to these principles for any other selected diameter, while taking account of the physical volume required in the chambers "B" and "C".

It will of course be apreciated that any references herein to cylinder are not restricted in scope to any specific geometrical shape of vessel or container and merely reflect the terminology most commonly used for domestic hot water storage containers. If desired, the cylinder of the invention can also be used for a domestic hot water supply solely (i.e. without central heating) simply by sealing off the water heater circuit connection means 10.

Claims

1. A domestic hot water cylinder for use with a sealed central heating (CH) system and an unvented hot water (HW) system supplied with water from a regulated pressure source, characterised in that in an upright position the cylinder is in the form of a self-contained enclosed fluid containment vessel (1) internally defining a first volume (A,C) forming an indirect HW cylinder and integral expansion tank and having a header region for storing air surmounting a region for storing water, the water storing region incorporating heater means for heating stored water and for thereby releasing dissolved air from said water whereby to fill the header region with air, first upper port means (8) adjacent the top of the water storing region for delivering stored fluid to the exterior of the vessel (1) and second lower port means (13,14) remote from the top of the water storing region for receiving water to be

stored from the exterior of the vessel (1);

a second volume (B) forming a CH system expansion tank and having a header region for storing air surmounting a region for storing water, said second volume (B) comprising an auto air vent means (11) arranged to enable venting of the second volume (B) to the exterior of the vessel when the stored water level in the second volume is less than a set level, the water storing region comprising port means (10) for transmitting CH system fluid to and from the exterior of the vessel (1);

the arrangement of said first (A,C) and second (B) volumes being such that each header region has a predetermined volumetric capacity which is greater than that required to accommodate thermal expansion of water from the pertaining water storing region; and a fluid transmitting passageway (6) extends between said first (A,C) and second (B) volumes said passageway (6) opening into the respective header regions at a level which is above that attained by thermal water expansion from the pertaining water storing region.

2. A domestic hot water cylinder according to claim 1, characterised in that the first volume (A,C) is provided with an automatic air vent (9a) operable by the water level in the first volume (A,C) to maintain the water level at least at a greater level than the first upper port means (8).
3. A domestic hot water cylinder according to claim 1 or claim 2, characterised in that the vessel (1) is provided with at least one pressure relief valve (9, 12) in the first volume (A, C).
4. A domestic hot water cylinder according to Claim 1, characterised in that the second volume (B) is defined by transverse partitioning walls (2, 3) through which at least one duct (5, 7) extends allowing communication between parts of the water storing region of the first volume (A, C) located above and below the second volume.

Revendications

1. Chauffe-eau à accumulation pour eau chaude sanitaire pour utilisation avec un système de chauffage central (CH) scellé et un système d'eau chaude (HW) sans évent alimenté en eau à partir d'une source à pression régulée, caractérisé en ce que dans une position verticale le chauffe-eau se présente sous la forme d'un récipient indépendant fermé de confine-

ment de fluide (1) définissant intérieurement un premier volume (A, C) formant d'un seul tenant un chauffe-eau indirect et un vase d'expansion et ayant une zone de collecteur pour accumuler l'air surmontant une zone pour l'accumulation de l'eau, la zone d'accumulation d'eau incorporant un moyen chauffant pour chauffer l'eau accumulée et pour ce faisant dégager l'air dissous de ladite eau pour ainsi remplir d'air la zone de collecteur, un premier moyen d'orifice supérieur (8) à proximité du haut de la zone d'accumulation d'eau pour délivrer le fluide accumulé à l'extérieur du récipient (1) et un second moyen d'orifice inférieur (13, 14) distant du haut de la zone d'accumulation d'eau pour recevoir depuis l'extérieur du récipient (1) l'eau à accumuler ;

un second volume (B) formant un vase d'expansion du système CH et ayant une zone de collecteur pour accumuler l'air surmontant une zone pour l'accumulation de l'eau, ledit second volume (B) comprenant un moyen d'évent automatique (11) agencé pour permettre l'échappement de l'air du second volume (B) vers l'extérieur du récipient lorsque le niveau de l'eau accumulée dans le second volume est inférieur à un niveau fixé, la zone d'accumulation d'eau comprenant un moyen d'orifice (10) pour transmettre du fluide du système CH en direction et à partir de l'extérieur du récipient (1) ;

l'agencement desdits premier (A, C) et second (B) volumes étant tel que chaque zone de collecteur a une capacité volumétrique prédéterminée qui est supérieure à celle requise pour absorber la dilatation thermique de l'eau venant de la zone d'accumulation d'eau concernée ; et qu'un passage de transmission de fluide (6) s'étend entre lesdits premier (A, C) et second (B) volumes, ledit passage (6) débouchant dans les zones de collecteur respectives à un niveau qui est au-dessus de celui atteint par la dilatation thermique de l'eau venant de la zone d'accumulation d'eau concernée.

2. Chauffe-eau à accumulation pour eau chaude sanitaire selon la revendication 1, caractérisé en ce que le premier volume (A, C) est muni d'un évent automatique (9a) qui peut être commandé par le niveau d'eau dans le premier volume (A, C) pour maintenir le niveau d'eau au moins à un niveau supérieur au premier moyen d'orifice supérieur (8).
3. Chauffe-eau à accumulation pour eau chaude sanitaire selon la revendication 1 ou la revendication 2, caractérisé en ce que le récipient (1)

est muni d'au moins une soupape de décharge (9, 12) dans le premier volume (A, C).

4. Chauffe-eau à accumulation pour eau chaude sanitaire selon la revendication 1, caractérisé en ce que le second volume (B) est défini par des parois de séparation transversales (2, 3) à travers lesquelles s'étend au moins un conduit (5, 7) permettant la communication entre des parties de la zone d'accumulation d'eau du premier volume (A, C) situées au-dessus et au-dessous du second volume.

Patentansprüche

1. Brauchwasserspeicher für den häuslichen Gebrauch zur Verwendung mit einem abgeschlossenen Zentralheizungssystem (CH) und einem nicht-entlüfteten Heißwassersystem (HW), das aus einer druckregulierten Quelle versorgt wird, dadurch gekennzeichnet, daß der Speicher in aufrechter Position ein abgeschlossenes, unabhängiges, Flüssigkeit enthaltendes Gefäß (1) darstellt, das nach innen
- ein erstes Volumen (A, C), das einen indirekten HW-Speicher und integralen Ausgleichsbehälter bildet, und das einen Kopfbereich zum Sammeln von Luft hat, der einen Bereich zum Bevorraten von Wasser überlagert, wobei der Bereich zum Bevorraten von Wasser Heizmittel zum Aufheizen des gesammelten Wassers aufweist, um dadurch gelöste Luft aus diesem Wasser auszutreiben, wodurch der Kopfbereich mit Luft gefüllt wird, mit ersten oberen Anschlußmitteln (8) zum Ableiten der gesammelten Flüssigkeit nach außerhalb des Behälters (1), die an den oberen Teil des Bereiches zum Bevorraten von Wasser angrenzen, und mit zweiten unteren Anschlußmitteln (13, 14) zum Zuführen von Wasser von außerhalb des Behälters (1) zum Bevorraten, die vom oberen Teil des Bereiches zum Bevorraten von Wasser beabstandet sind; und
 - ein zweites Volumen (B) begrenzt, das einen CH-System Ausgleichsbehälter bildet, und das einen Kopfbereich zum Sammeln von Luft hat, der einen Bereich zum Bevorraten von Wasser überlagert, wobei das zweite Volumen (B) automatische Luft-Entlüftungsmittel (11) aufweist, die so angeordnet sind, daß sie ein Entlüften des zweiten Volumens (B) nach außerhalb des Behälters ermöglichen, wenn das Niveau des bevorrateten Was-

sers im zweiten Volumen niedriger ist als ein vorbestimmtes Niveau, und wobei der Wasser bevorratende Bereich Anschlußmittel (10) zum Überführen von Flüssigkeit des CH-Systems von und nach außerhalb des Behälters (1) aufweist;

wobei die Anordnung der ersten (A, C) und zweiten (B) Volumina in der Weise vorgesehen ist, daß jeder Kopfbereich ein vorbestimmtes volumetrisches Fassungsvermögen hat, das größer ist als erforderlich, um die thermische Ausdehnung von Wasser aus dem zugehörigen Bereich zum Bevorraten von Wasser zuzulassen, und sich ein Flüssigkeit überführender Verbindungsgang (6) erstreckt sich zwischen dem ersten (A, C) und dem zweiten (B) Volumen, wobei dieser Verbindungsgang (6) in dem jeweiligen Kopfbereich in einer Höhe mündet, die über derjenigen ist, die durch die thermische Ausdehnung des Wassers aus dem zugehörigen Bereich zum Bevorraten des Wassers erreicht wird.

2. Brauchwasserspeicher nach Anspruch 1, dadurch gekennzeichnet, daß das erste Volumen (A, C) mit einer automatischen Luft-Entlüftungsanlage (9a), die durch das Wasserniveau im ersten Volumen (A, C) betrieben wird, um das Wasserniveau auf einem Niveau zu halten, das mindestens höher ist, als die ersten oberen Anschlußmittel (8).
3. Brauchwasserspeicher nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß der Behälter (1) mindestens mit einem Druckbegrenzungsventil (9, 12) im ersten Volumen (A, C) versehen ist.
4. Brauchwasserspeicher nach Anspruch 1, dadurch gekennzeichnet, daß das zweite Volumen (B) durch querstehende Trennwände (2, 3) begrenzt wird, durch die sich mindestens eine Leitung (5, 7) erstreckt, die eine Verbindung zwischen den Teilen des Bereiches zum Bevorraten von Wasser des ersten Volumens (A, C) ermöglicht, die oberhalb und unterhalb des zweiten Volumens angeordnet sind.

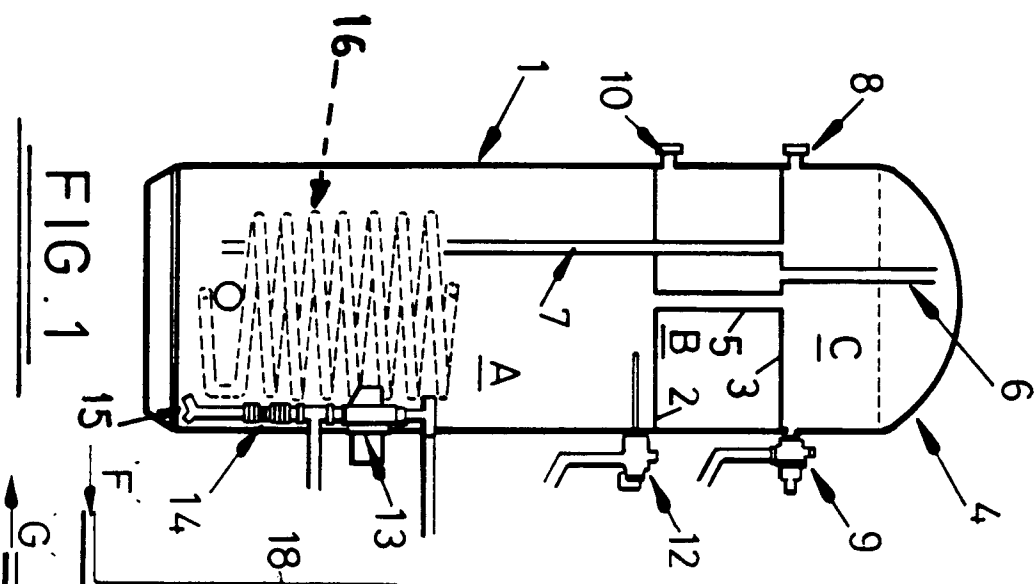


FIG. 1

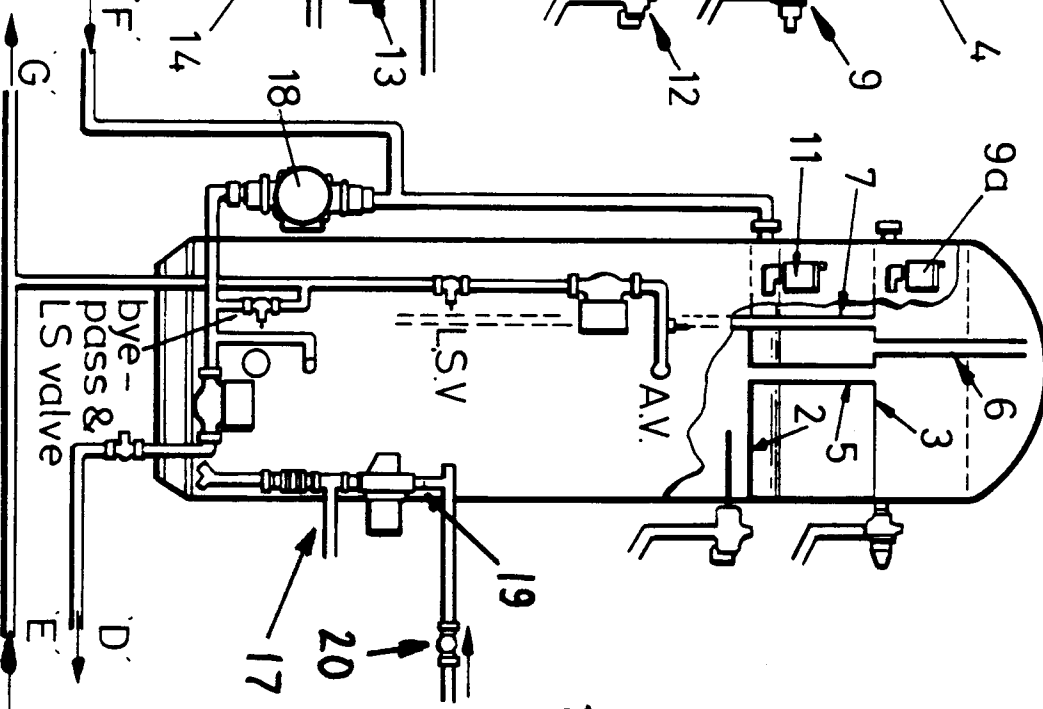


FIG. 2

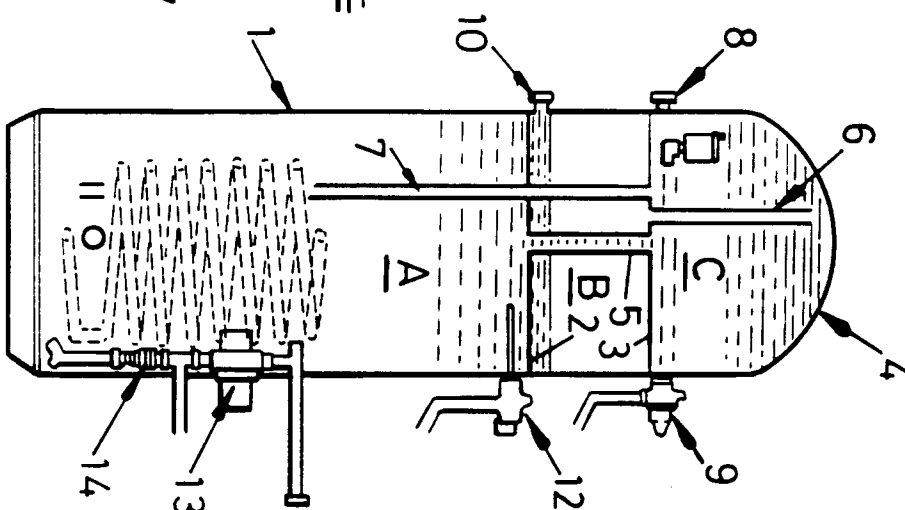


FIG. 3