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(54) **FLUIDS TANK FOR WORK MACHINE**

FLÜSSIGKEITSTANK FÜR EINE ARBEITSMASCHINE

RÉSERVOIR DE FLUIDES POUR MACHINE DE TRAVAIL

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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to work machines and more specifically to fluid tanks for such machines.

2. Background of the Invention

[0002] Work machines, such as excavators, require tanks to store fluid of various types utilized by the machine. Examples of typical fluids may be: fuel for consumption by the engine, hydraulic fluid for use in the machine actuating system, engine lubricant and diesel exhaust fluid (DEF). The usual practice for employing fluid tanks is to incorporate a separate tank for each fluid because of unique environmental conditions for each fluid. Such conditions may be differences in operating temperatures, chemical compositions, operating pressures and the like. While this serves the individual nature of the fluids, it requires separate tanks that usually lead to separate suppliers, quality control and mounting, all of which add to the complexity and theoretically having an impact on reliability.

[0003] It has been proposed that a unified tank be incorporated in patent DE10 2013 105884A1. This reference illustrates a unitary tank with a separating wall molded in. The fluids for use in this reference are fuel consumed by an engine and a smaller reservoir for DEF. The fuel and DEF operate under similar conditions in that they are consumable fluids operating under similar temperature conditions in the tank.

[0004] FR2975641 describes a fluid tank according to the preamble of claim 1.

[0005] Accordingly, what is needed in the art is a simplified fluids tank for a work machine that accommodates fluids having differing operating conditions.

SUMMARY OF THE INVENTION

[0006] The present invention seeks to simplify the provision of unitary tanks for fluids in a work machine.

[0007] In one form, the invention is a fluids tank according to claim 1.

[0008] In another form, the invention is an excavator having a frame, ground movement mechanism, a fuel consuming power unit, a hydraulic actuation system and a fluids tank according to claim 1, all mounted on the frame. The fluids tank includes a unitary body of moldable material defining first and second compartments for different fluids, the fluids tank having a coextensive integral wall separating the first and second compartments, with the coextensive wall providing an insulating heat transfer barrier between the compartments for fluids operating at different temperatures.

[0009] One benefit of the present invention is that a fluid tank for two fluids may be molded in one process.

[0010] Another advantage is that the fluid tank can accommodate fluids having different operating temperatures.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] The above-mentioned and other features and advantages of this invention, and the manner of attaining them, will become more apparent and the invention will be better understood by reference to the following description of embodiments of the invention taken in conjunction with the accompanying drawings, wherein:

Fig. 1 is a side view of an excavator work machine with which the present invention may be used; and,

Fig. 2 is a cross sectional view of a fluids tank embodying the present invention.

[0012] Corresponding reference characters indicate corresponding parts throughout the several views. The exemplifications set out herein illustrate embodiments of the invention, and such exemplifications are not to be construed as limiting the scope of the invention in any manner.

DETAILED DESCRIPTION OF THE INVENTION

[0013] Referring to Fig. 1, there is shown a work machine in the form of an excavator, having as its primary purpose, excavating material on a site for construction or other purposes. The work machine 10 has a frame 12 for supporting its major components, including a ground movement assembly 14, herein shown as a crawler tractor arrangement. It should be apparent that ground movement assemblies other than crawler tractor arrangement 14 may be utilized with the present invention. The frame 12 also supports a boom arm assembly 16 having a plurality of articulated joints that ultimately connect to a bucket 18 for excavation purposes. Multiple hydraulic actuators 20 cause movement in the boom arm assembly 16 and the bucket 18 to provide the excavating function.

[0014] The work machine 10 is powered by a power unit shown schematically at 22. In usual practice the power unit 22 is a compression ignition or diesel engine owing to its fuel efficiency and durability. The diesel engine consumes diesel fuel for its operation. The actuators 20 are supplied with hydraulic fluid from a hydraulic actuation system (not shown). The hydraulic actuation system recirculates hydraulic fluid and for that purpose requires a tank to accommodate thermal dissipation and replenishment of leaked fluids. The power unit 12 also requires a tank for fuel. These needs are met by a fluids tank 24, shown schematically in Fig. 1 and in detail in Fig. 2.

[0015] Referring to Fig. 2, the fluids tank 24 includes a moldable plastic material 26 defining a first compartment 28 and a second compartment 30. First compart-

ment 28 has fluid access fittings adapted for use in the hydraulic system powering the actuators 20. Many hydraulic systems provide a constant flow of fluid from a hydraulic pump past the actuators and to the tank where it is repressurized for further use. The action of pumping up the hydraulic fluid to required actuation pressures causes an increase in operating temperatures that can be as high as 60 to 90 degrees C.

[0016] The compartment 30 receives fuel to be consumed by the power unit 22 and has a fuel supply outlet fitting at a lower portion of the compartment 30, a removable fill cap 36 for enabling replenishment of the compartment 30 with fuel and a breather fitting 40 to accommodate the significant change in fuel volume in the tank over a given operating period. The compartment 30 also has a sump area 38 that is a recess lower at the lowest portion of compartment 30 to insure a liquid supply as the compartment 30 has fuel significantly removed from it.

[0017] In accordance with the present invention, the fluids tank 24 has a coextensive integral wall 42 separating the first and second compartments 28 and 30. The wall 42 is formed from material providing an insulating and heat transfer barrier between the compartments. This prevents the operating temperatures in the hydraulic fluid compartment 28, which range from 60 to 90 degrees C, from elevating the temperature of fuel within compartment 30 which can range from 30 to 70 degrees C maximum to prevent efficiency losses. A preferred material for forming a tank is a polyethylene material and the coextensive integral wall is formed from a polyethylene foam. An example of a suitable material is a cross linkable high density polyethylene developed for rotational molding and available from ICO polymers under the designation Icorene 1500 black 9000. A desirable heat transfer coefficient for the coextensive internal wall integral wall 42 is 0.040 WATT/square meters/KELVIN. It should be apparent however to those skilled in the art that materials other than the one described above may be employed to provide the unitary tank having two different fluids.

[0018] In another embodiment (not shown) the coextensive wall 42 is formed including air enclosures. The stationary air of these enclosures form the insulating and heat transfer barrier between the compartments. It is understood that a combination of rigid coextensive walls or foamed coextensive walls with air enclosures can provide a suitable limitation of heat transfer between the compartments 28 and 30.

[0019] The fluids tank 24 is mounted within the work machine 10 at a convenient location. The filling of the fuel dictates that an access door be opened and that the fluid level in the hydraulic tank may be conveniently inspected and determined at the time fuel is introduced into compartment 30. Notwithstanding the fact that the fluids within the compartments 28 and 30 are operating at significantly different temperatures, the provision of the insulating coextensive wall 42 provides an effective thermal barrier during operating conditions.

Claims

1. A fluids tank (24) for a work machine (10), said fluids tank (24) comprising:

   a unitary body (26) of moldable material defining first and second compartments (28, 30) for different fluids;
   a coextensive integral wall (42) separating said first and second compartments (28, 30), said coextensive wall (42) providing an insulating heat transfer barrier between the compartments (28, 30) for containing fluids at different operating temperatures;
   said fluid tank being **characterized in that**:said moldable material (26) is a polyethylene and the coextensive integral wall is polyethylene foam; and the heat transfer coefficient of said coextensive integral wall (42) is about 0.040 watts/square meter/Kelvin.

2. The fluids tank (24) as claimed in claim 1, wherein the maximum operating temperature in one of the compartments (28) is up to 90 degrees C and the maximum operating temperature in the other compartment (30) is up to 70 degrees C.

3. The fluids tank (24) as claimed in claim 1, wherein the wall (42) comprises air enclosures.

4. The fluids tank (24) as claimed in claim 1, in combination with a work machine (10) comprising:

   a frame (10),
   a ground movement assembly (14);
   a boom arm assembly (16);
   hydraulic actuators (20) mounted on said frame (10) to articulate said boom arm assembly (16);
   a power unit (22) mounted on said frame (10);
   said fluids tank (24) being mounted on said frame (10) and supplying fuel to said power unit (22) and hydraulic fluid to said hydraulic actuators (20).

5. The fluids tank (24) as claimed in claim 2, wherein said larger compartment (30) has a sump area (38) at the bottom thereof for a fuel output supply fitting (34).

Patentansprüche

1. Fluidtank (24) für eine Arbeitsmaschine (10), wobei der Fluidtank (24) umfasst:

   einen einheitlichen Körper (26) aus einem gießbaren Material, der eine erste und eine zweite Kammer (28, 30) für unterschiedliche

Fluide definiert;
eine flächengleiche, integrale Wand (42), die die erste und die zweite Kammer (28, 30) trennt, wobei die flächengleiche Wand (42) eine isolierende Wärmeübertragungssperre zwischen den Kammern (28, 30) bereitstellt, um Fluide unterschiedlicher Betriebstemperaturen zu enthalten;
wobei der Fluidtank **dadurch gekennzeichnet ist, dass**: das gießbare Material (26) ein Polyethylen ist und die flächengleiche, integrale Wand ein Polyethylenschaum ist;
und der Wärmeübertragungskoeffizient der flächengleichen, integralen Wand (42) etwa 0,040 Watt/Quadratmeter/Kelvin ($W/(m^2 \cdot K)$) beträgt.

2. Fluidtank (24) nach Anspruch 1, wobei die maximale Betriebstemperatur in einer der Kammern (28) bis zu 90 Grad C und die maximale Betriebstemperatur in der anderen Kammer (30) bis zu 70 Grad C beträgt.

3. Fluidtank (24) nach Anspruch 1, wobei die Wand (42) Lufteinschlüsse umfasst.

4. Fluidtank (24) nach Anspruch 1 in Kombination mit einer Arbeitsmaschine (10) umfassend:

einen Rahmen (12),
eine Anordnung (14) zur Bewegung auf dem Boden;
eine Auslegerarmanordnung (16);
Hydraulikantriebe (20), die am Rahmen (12) angebracht sind, um die Auslegerarmanordnung (16) zu bewegen;
einen Antrieb (22), der am Rahmen (12) angebracht ist;
wobei der Fluidtank (24) am Rahmen (12) angebracht ist und den Antrieb (22) mit Treibstoff versorgt und die Hydraulikantriebe (20) mit einem Hydraulikfluid versorgt.

5. Fluidtank (24) nach Anspruch 2, wobei die größere Kammer (30) einen Sammelbereich (38) für einen Treibstoffabgabe-Versorgungsanschluss (34) an ihrem Boden aufweist.

Revendications

1. Un réservoir de fluides (24) pour un engin de chantier (10), ledit réservoir de fluides (24) comprenant :

un corps unitaire (26) de matière moulable définissant les premier et deuxième compartiments (28, 30) pour différents fluides ;
une paroi intégrale coextensive (42) séparant lesdits premier et deuxième compartiments (28, 30), ladite paroi intégrale coextensive (42) constituant une barrière de transfert de chaleur isolante entre les compartiments (28, 30) permettant de contenir des fluides à différentes températures d'exploitation ;
ledit réservoir de fluides **caractérisé en ce que** : ladite matière moulable (26) est en polyéthylène et la paroi intégrale coextensive est en mousse de polyéthylène ;
et le coefficient de transfert de chaleur de ladite paroi intégrale coextensive (42) est d'environ 0,040 Watt/mètre carré/Kelvin.

2. Le réservoir de fluides (24) selon la revendication 1, dans lequel la température d'exploitation maximale dans l'un des compartiments (28) atteint jusqu'à 90 degrés C et la température d'exploitation maximale dans l'autre compartiment (30) atteint jusqu'à 70 degrés C.

3. Le réservoir de fluides (24) selon la revendication 1, dans lequel la paroi (42) comprend des enceintes d'air.

4. Le réservoir de fluides (24) selon la revendication 1, en combinaison avec un engin de chantier (10) comprenant :

un châssis (12),
un assemblage de mouvement sur le sol (14) ; un ensemble à bras articulé (16) ;
des vérins hydrauliques (20) montés sur ledit châssis (12) pour articuler ledit ensemble à bras articulé (16) ;
une unité d'alimentation (22) montée sur ledit châssis (12) ;
ledit réservoir de fluides (24) étant monté sur ledit châssis (12) et alimentant en carburant ladite unité d'alimentation (22) et en fluide hydraulique, lesdits vérins hydrauliques (20).

5. Le réservoir de fluides (24) selon la revendication 2, dans lequel ledit plus grand compartiment (30) dispose d'une zone de puisard (38) à sa base pour un raccord d'alimentation en carburant (34).

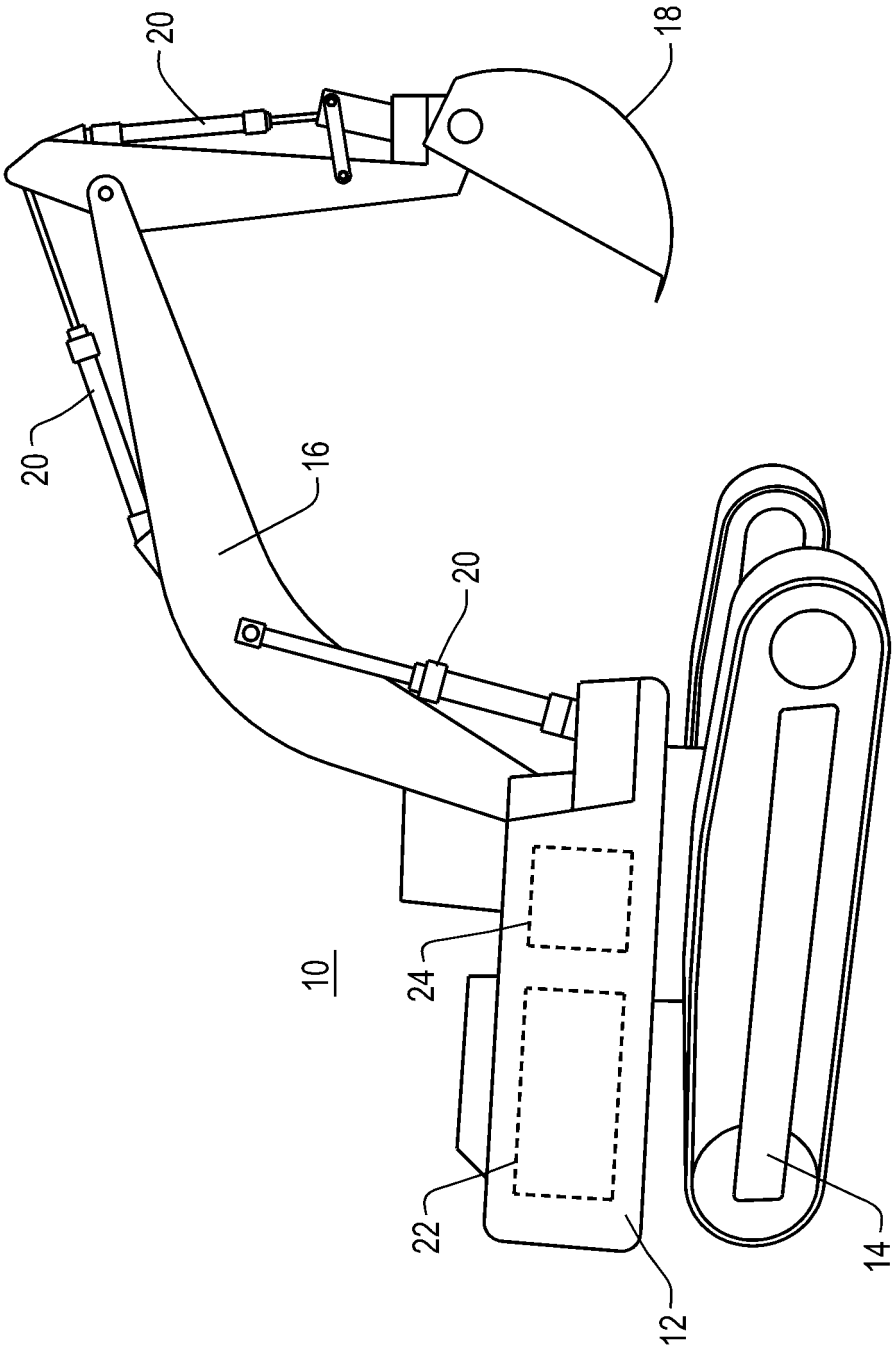

Fig. 1

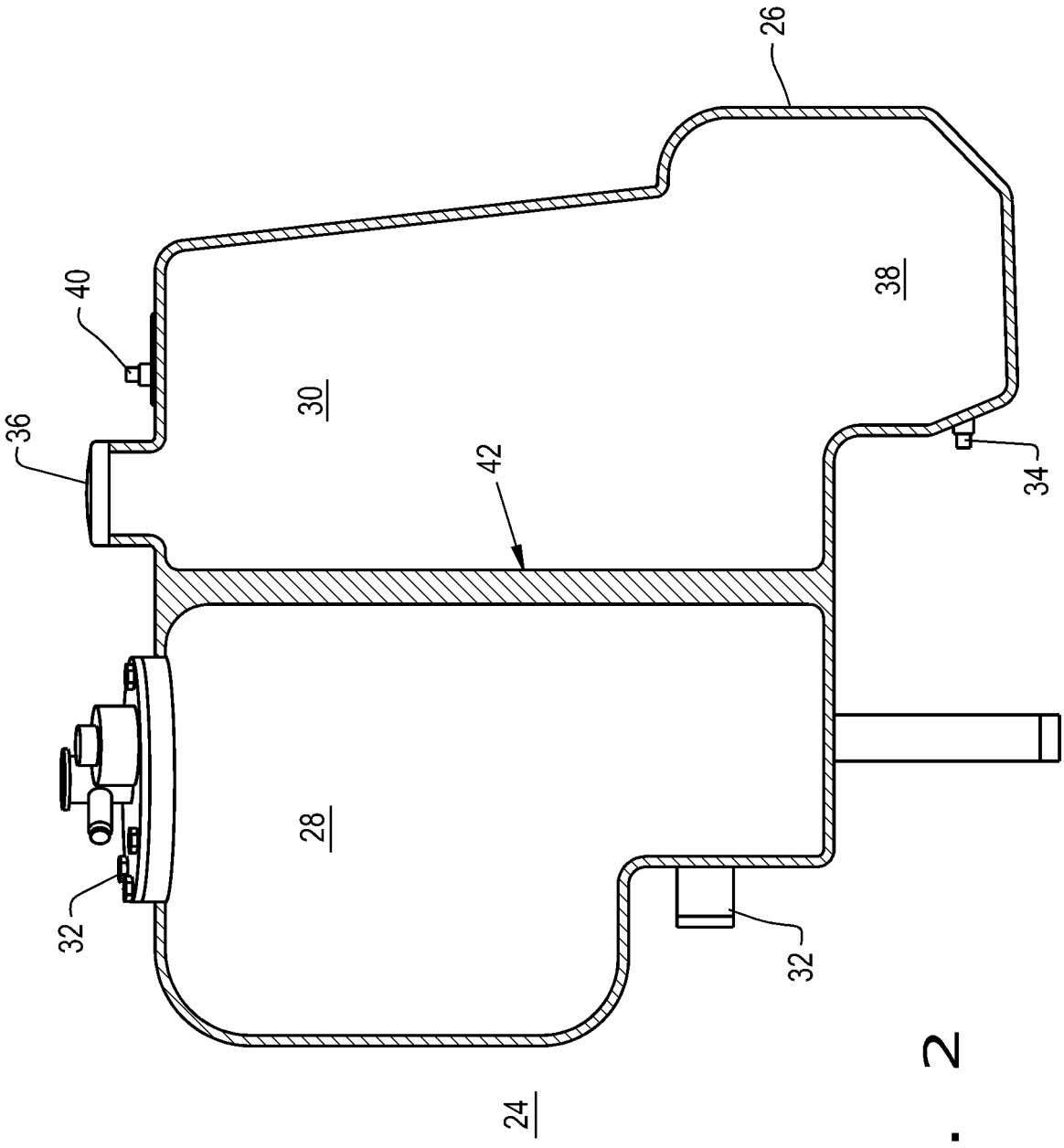

Fig. 2

REFERENCES CITED IN THE DESCRIPTION

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- FR 2975641 **[0004]**