April 10, 1934. J. J. MULLEN 1,954,597

TRANSFORMER TANK

Filed June 19, 1931

FIG. 1.

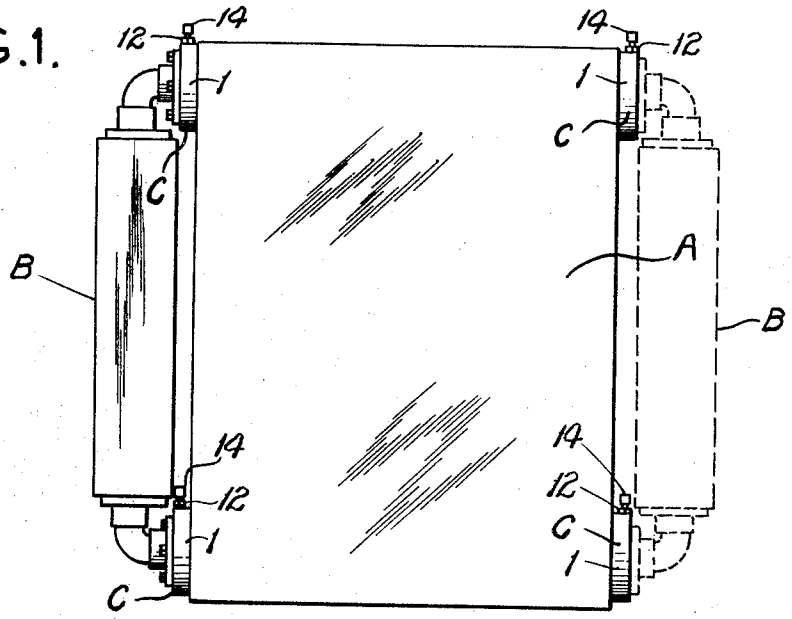


FIG. 2.

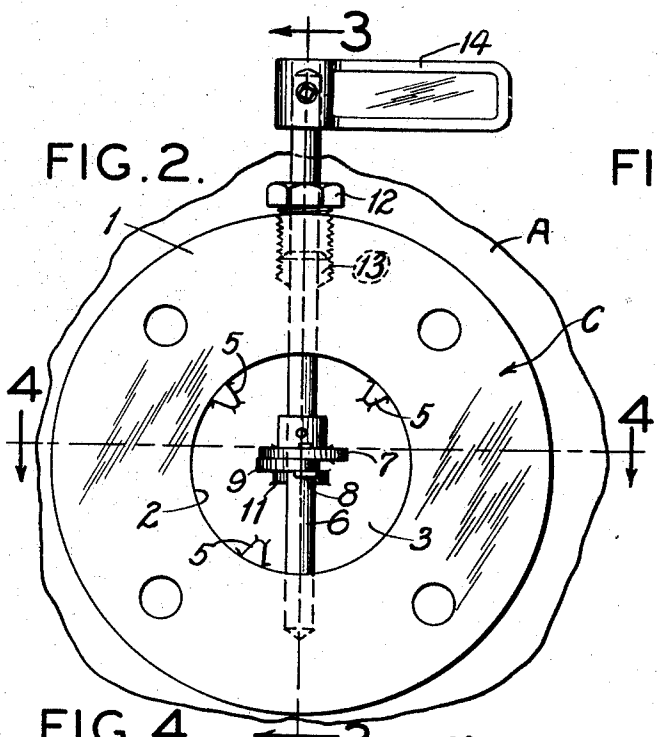


FIG. 3.

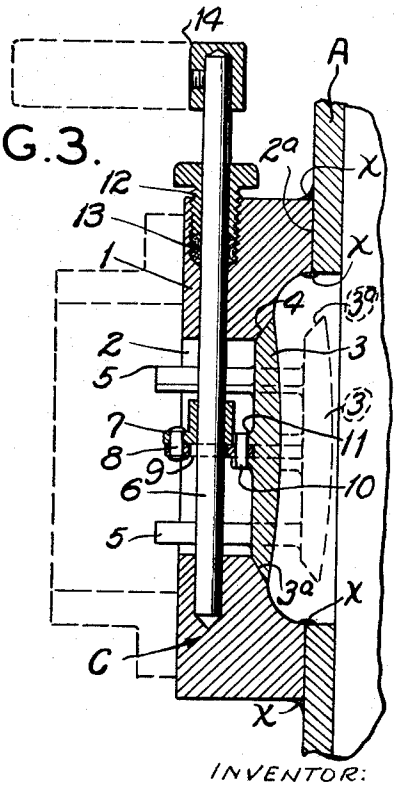
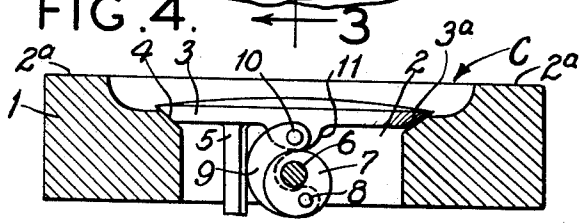


FIG. 4.



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1,954,597

TRANSFORMER TANK

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1 Claim. (Cl. 137—21)

This invention relates to transformers of the type that comprise a tank adapted to hold oil or some other cooling liquid in which the transformer is submerged, and equipped with external radiators arranged so that the liquid in the tank can circulate through said radiators and be cooled during its travel through the radiators.

In transporting transformers of the type mentioned from the place of manufacture to the place of use, the oil or other cooling liquid is not removed from the tank prior to shipment, but it is the general custom to dismount or remove the radiators on the exterior of the tank so as to facilitate handling the transformer and reduce the floor space required by the transformer during shipment. Accordingly, transformer tanks that have external radiators are invariably equipped with shut off valves arranged at the points where the radiators are attached to the tank, which valves are adapted to be closed when the radiators are disconnected from the tank prior to shipping the transformer. The shut off valves which have heretofore been used on transformer tanks consisted of globe valves or gate valves, which, in addition to being expensive, are of such dimensions that they prevent the radiators from being arranged in close proximity to the side wall of the tank. In fact, it is not unusual for a transformer tank to be equipped with shut-off valves that project as much as five inches from the side wall of the tank, thus requiring the radiators to be spaced relatively far away from the side wall, and consequently, adding about ten inches to the overall dimensions of the tank. This is a serious objection, as the floor space required by a transformer is very often the controlling factor that determines whether or not the transformer can be installed in a selected space.

The main object of my invention is to provide a transformer tank that is equipped with an efficient radiator shut-off valve whose overall length is considerably less than the length of the globe valves and gate valves heretofore used on transformer tanks, thereby making it possible to mount the radiators in close proximity to the side wall of the tank, and consequently, reducing the floor space required by the transformer when it is installed.

Another object is to provide a radiator shut-off valve for transformer tanks that can be manufactured at a considerably lower cost than the gate valves and globe valves heretofore used on transformer tanks at the radiator connections.

And still another object of my invention is to provide a transformer tank that is equipped with radiator shut-off valves which are of such construction that it is not necessary to weld plates or laterally-projecting sleeves onto the side wall of the tank so as to provide supports for the valve, as has heretofore been the usual practice.

Figure 1 of the drawing is a side elevational view of a transformer tank equipped with radiator shut-off valves constructed in accordance with my invention.

Figure 2 is an enlarged front elevational view of one of my improved valves.

Figure 3 is a vertical longitudinal sectional view, taken on the line 3—3 of Figure 2; and

Figure 4 is a horizontal sectional view, taken on the line 4—4 of Figure 2.

In the accompanying drawing which illustrates the preferred form of my invention, A designates a transformer tank constructed of metal and adapted to be filled with oil or some other cooling liquid in which the transformer is submerged, and B designates radiators on the exterior of said tank that are used to cool or abstract heat from the liquid in the tank. At the two points where each radiator is attached to the tank A shut-off valves C are arranged, which valves are adapted to be closed so as to prevent the liquid in the tank from escaping through the radiator connections when the radiators are removed preparatory to shipping the transformer.

Each of the valves C comprises a plate-like body portion 1, formed preferably of steel, and having a flow passageway 2, and a reciprocating valve element 3 in said body portion provided with a beveled edge 3^a that is adapted to contact with a tapered seat 4 formed on the body portion 1 at the inner end of the flow passageway 2 in said body portion. The body portion 1 is of substantially annular shape in general outline, and it is provided at its inner side with an integral, reduced attaching part 2^a, also of annular shape, that is adapted to be attached to the outer face of the side wall of the tank A preferably by welded joints x located at the inner and outer edges of the annular-shaped attaching part 2^a on the valve body, as shown in Figure 3. The inner edge of said annular attaching part 2^a is of greater diameter than the flow passage 2 and is spaced some distance inwardly from the valve seat 4, so that when the valve element 3 is in its open position, as shown in broken lines in Figure 3, there will be ample space or clearance for the liquid between the valve element and the body portion 1 of the valve.

The valve element 3, which is of substantially disk-shape in general form, is provided with a plu-

rality of guides 5 that project laterally from the outer side of same and which bear against the side wall of the flow passageway 2 in the body portion 1 of the valve, said guides 5 being of such length that they will always remain in sliding engagement with the side wall of the flow passageway 2 in the valve body, even when the valve element 3 is in its extreme open position, shown in broken lines in Figure 3.

Reciprocating movement is imparted to the valve element 3, so as to open and close same, by means of an operating shaft 6 rockably mounted in the valve body 1 and joined to the valve element 3 in such a way that when the shaft 6 is rocked in one direction, the valve element 3 will move in a straight line away from its seat 4, and thus uncover or open the flow passageway 2, and when said operating shaft is rocked in the opposite direction, the valve element 3 will move in a straight line back to its closed position, wherein the beveled edge 3^a on the valve element snugly engages the valve seat 4 on the valve body.

The means used to transmit movement from the operating shaft 6 to the valve element and cause said valve element to reciprocate when the operating shaft 6 is rocked, comprises a cam 7 on the operating shaft 6 that is pivotally connected at 8 to a curved link 9 whose opposite end is connected by a pivot 10 to a lug 11 which projects outwardly from the outer side of the valve element 3. The eccentrically-disposed pivot 8 that joins the outer end of the curved link 9 to the cam 7 on the operating shaft is preferably so disposed that when said shaft is rocked in a direction to shift the valve element 3 into its open position, said pivot 8 will move past center, or beyond the center line of the pivotal connection between the link 9 and the valve element, and thus effectively eliminate the possibility of the valve element moving accidentally into its closed position, due to vibration, or to the pressure which the liquid in the tank exerts on the valve element 3. In other words, the means that is used to transmit movement from the operating shaft 6 to the valve element 3 is so constructed that when said valve element is shifted into its open position it is effectively locked and held against accidental movement. Likewise, when the valve element 3 is shifted into its closed position, it is effectively locked and held against accidental movement by reason of the fact that the pivot pin 8 that joins the outer end of the link 9 to the cam 7 on the operating shaft moves past center, and finally comes to rest at a point to one side of the longitudinal axis of the valve element 3, as shown in Figure 4. One end of the operating shaft 6 terminates inside of the valve body and is journaled in a recess formed in the valve body 1. The other end of said operating shaft projects outwardly through the valve body, and at the point where said operating shaft 6 projects through the valve body, a gland nut 12 is arranged so as to compress a packing 13 that maintains a tight joint between the operating shaft 6 and the valve body. The shaft 6 is provided at its outer end with a handle 14 which may be provided on one side with the word "Open", so as to indicate when the valve element 3 is in its wide open position; and provided on its opposite side with the word "Closed", so as to indicate when the valve element 3 is closed.

The overall length of a valve of the construction above described is only about one-third of the overall length of valves of the kind that have heretofore been used at the radiator connections of transformer tanks, and consequently, it permits a transformer tank equipped with external radiators to be installed in places where it would be impossible to install a transformer tank equipped with conventional globe valves or gate valves. Such a valve can be manufactured at a materially lower cost than shut-off valves of the kind heretofore used on transformer tanks, and it has the added advantage of being capable of being attached directly to the side wall of the tank by a welding operation, thereby overcoming the necessity of welding a separate supporting plate on the side wall of the tank to which the valve is bolted, as is necessary with the valves that have heretofore been used on transformer tanks.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:

A radiator shut-off valve for transformer tanks, comprising a plate-like body portion adapted to be welded to the exterior of said tank, said body portion having a flow passage, a valve seat on said body portion located at a point beyond or on the outside of the tank and surrounding said flow passage, an integral annular attaching part on said body portion of considerably greater diameter than said valve seat and spaced inwardly from same, a reciprocating valve element in said body portion adapted to co-act with said valve seat, an operating shaft rockably mounted in said body portion and disposed transversely of the flow passage, one end of said shaft terminating in a recess in the body portion and the other end of said shaft projecting outwardly through the body portion, a cam shaped device rigidly secured to said shaft, and a link for transmitting movement from said shaft to said valve element to open and close the same, pivotally connected at its inner end to the center of said valve element and pivotally connected at its outer end to said cam shaped device by a pivot disposed eccentrically with relation to said shaft, said link being curved so as to permit said shaft to lie between the pivots at the opposite ends of said link when said valve is seated.

JAMES J. MULLEN.