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THERMOCOUPLE RETURN BEND AND WELL

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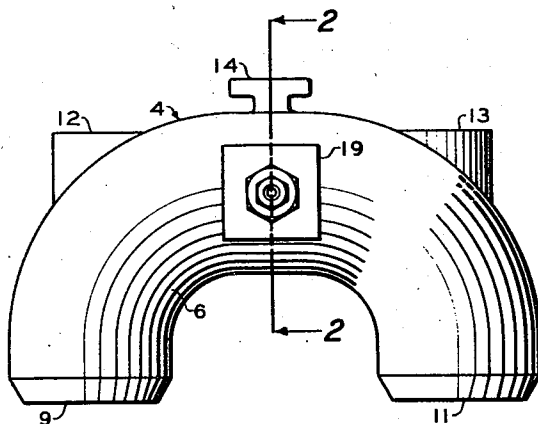


FIG. 1

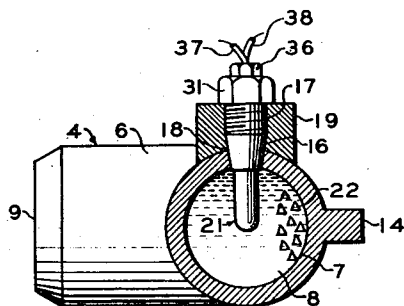


FIG. 2

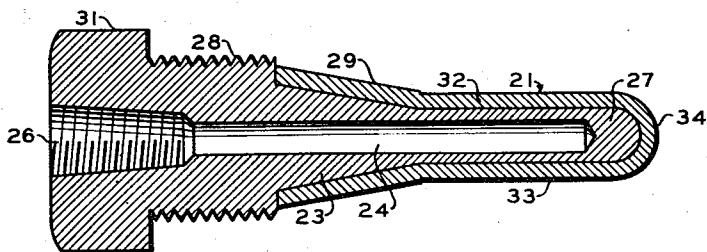


FIG. 3

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THERMOCOUPLE RETURN BEND AND WELL

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1

This invention relates to a return bend containing a well for a thermo-sensitive instrument. In one specific aspect it relates to a return bend containing a well which is disposed out of the path of abrasive particles. Other specific aspects relate to wells for thermo-sensitive instruments.

In the art of cooling and more especially of heating fluids it is customary to carry out the heat exchange in a number of straight lengths of pipe each pipe connected to an adjacent pipe by a U-shaped pipe known as a return bend. The return bends often project from the end of the heat exchanger, or furnace, and therefore I locate my well for a thermo-sensitive instrument in the return bend.

One object of the present invention is to provide an improved return bend and well.

Another object is to locate a well for a thermo-sensitive instrument in a return bend in such a manner that abrasion is reduced.

Another object is to provide an improved well for a thermo-sensitive instrument.

Numerous other objects and advantages will be apparent to those skilled in the art upon reading the accompanying specification, claims and drawings.

In the drawings:

Figure 1 is an elevational view of a return bend embodying the present invention.

Figure 2 is a cross sectional view taken along the line 2-2 of Figure 1 looking in the direction indicated, but with a thermo-sensitive instrument not shown in Figure 1 installed in the well.

Figure 3 is a cross-sectional view of the well shown in Figures 1 and 2, the cross section being taken through the longitudinal axis of said well.

In Figure 1 a return bend generally designated as 4 comprises a U-shaped piece of pipe 6 containing a U-shaped passage 7 disposed to direct a fluid 8 (which may be a liquid or a gas, but which is shown as a liquid in Figure 2) through a 180° turn. Pipe 6 has suitable connection means 9 and 11 on its ends for forming a seal with the straight pipes of the heat exchanger (not shown). While a heat exchanger is referred to, and generally the heat exchanger is for heating the fluid 8 rather than cooling the same, other non-thermochanges may take place in these straight pipes and return bends. For example, some sort of contacting of fluids may occur, or mixtures of fluids and solids, all without changing the present invention which relates to a return bend 4 which may be used for any purpose to which return bends are put in the prior art.

2

Connection surfaces 9 and 11 may be any type known to the prior art, and may be internal or external, screw threaded or smooth, the type shown being adapted to be forced against a soft seat to form a seal or else welded to the adjacent straight section of pipe. The manner of connection of the return bend does not change the invention.

When return bend 4 is to be held in place by some clamping means, this clamping means may include screws engaging lugs 12 and 13. When return bend 4 is to be welded to the straight pipes (not shown) then lugs 12 and 13 are unnecessary and may be omitted.

Similarly a handle 14 is supplied on most return bends which is useful in assembling and disassembling the heat exchanger, but which is not essential. Handle 14 may be omitted.

Pipe 6 has a bore 16 connecting passage 7 with the exterior at a point in the center portion of pipe 6, said bore 16 having an outer screw thread portion 17 and an inner conical seat portion 18. Portions 17 and 18 may be formed in the wall of 6 as boss 19 can be formed integral with pipe 6. However, boss 19 is shown as a separable element because these devices are being made this way at present, boss 19 being built up by welding with a 25 to 20 stainless steel welding rod. In large scale manufacturing, it is preferred to make boss 19 integral with pipe 6 rather than as shown.

The axis of bore 16 is normal to the plane of the U-shaped passage 7 as shown in Figure 2 so that the well, generally designated as 21 will extend out into the central portion of fluid 8 without passing through the portion of the U-shaped passage where centrifugal force tends to throw solid particles such as 22.

Well 21 comprises a pipe 23 having central passage 24 open at its outer end 26 but closed at its inner end 27. Well 21 is secured in bore 16 with its closed end 27 extending into the passage, screw threads 28 on the exterior of the well engaging screw threads 17 and conical surface 29 on the well engaging conical seat 18. To aid assembly and disassembly of the well a non-circular tool engaging portion 31 is provided.

Obviously other means of securing well 21 in bore 16 may be employed with valuable results but screw threads 28 and conical seat 29 are preferred.

While the position of well 21 in the center of passage 7 is out of the path of the heavier particles 22, which are thrown to the outside by centrifugal force as they travel around the U-shaped passage, nevertheless, well 21 is subjected to wear

3

and therefore it is preferred to cover at least that portion of pipe 23 which extends into the passage 7 with a welded on layer of hard metal 32. It is preferable in fact to have conical seat 29 covered with this same layer of hard metal 32 and surface 29 is made smooth by grinding the same in order to fit seat 18. While not essential it is preferable to also grind the outside of surface 33 and round the nose 34 by grinding the same.

Layer 32 may be any one of a number of hard metal or metal alloys which may be applied by any process known to the prior art, but it is preferred to deposit layer 32 on the well 21 by welding and building it up from a melted welding rod (not shown), such a method being old for making hard surfaces on objects such as drill bits and the like.

However, as the metal to be used for layer 32, I prefer to use "Stellite," a trade-marked product which has the following composition:

	Per cent
Cobalt -----	40-80
Tungsten -----	0-25
Chromium (preferably 20-35% chromium) -----	10-40
Carbon (preferably 0.75-2.5% carbon) --	0-2.5
Silica -----	3

The interior of well 21 has a cavity 24 which may be provided with a screw threaded section 26. Whatever sensing instrument is employed it is inserted in cavity 24 and may be retained by suitable means such as ferrule or bushing 36. While all kinds of sensing instruments may be employed, such as a common mercury thermometer (not shown), well 21 is especially adapted to contain thermocouple junctions (not shown) which may be attached to the ends of wires 37 and 38 and held in cavity 24 by bushing 36.

Operation

As shown in Figure 2 in operation the fluid passing through return bend 4 has its direction of motion changed by 180°. This change in the direction of motion results in annular accelerations so that heavier solid particles 22, which may be present in fluid 8, are carried by centrifugal force to the outside of the U-shaped bend 6 so that well 21 is not in their path, thus reducing the amount of wear on well 21. As well 21 is more likely to wear out before the pipe 6 does, the result is to lengthen the life of the return bend 4.

The embodiment shown in the drawings and described in the specification was chosen for illustrative purposes as a preferred form of the invention, the scope of which is defined in the following claims.

Having described my invention, I claim:

1. A return bend and well for a thermo-sensitive instrument comprising in combination a piece of pipe having a U-shaped passage therein disposed to direct a fluid through a turn, said pipe having a bore connecting said passage to the exterior at a point in the central portion of said pipe, said bore having an outer screw threaded portion and an inner conical seat portion, the axis of said bore being normal to the plane containing the axis of the U-shaped passage, and a well comprising a pipe having a central passage open at its outer end but closed at its inner end secured in said bore with the closed end extending into the passage along the axis of said bore and spaced from the inner wall along the outside radius of said U-shaped passage whereby

4

solid particles in the fluid flowing through said U-shaped passage tend to be carried by centrifugal force in a path out of contact with said well, screw threads on the exterior of said well engaging said screw threaded portion, and a conical surface on the exterior of said well sealing against said conical seat portion, at least that portion of said well extending into said passage being coated with a welded on layer of hard metal "Stellite."

2. A return bend and well comprising in combination a piece of pipe having a U-shaped passage therein disposed to direct a fluid through a turn, said pipe having a bore connecting said passage to the exterior at a point in the central portion of said pipe, said bore having an outer screw threaded portion and an inner conical seat portion, the axis of said bore being normal to the plane containing the axis of the U-shaped passage, and a well comprising a pipe having a central passage open at its outer end but closed at its inner end secured in said bore with the closed end extending into the passage along the axis of said bore and spaced from the inner wall along the outside radius of said U-shaped passage whereby solid particles in the fluid flowing through said U-shaped passage tend to be carried by centrifugal force in a path out of contact with said well, at least that portion of said well extending into said passage being coated with a welded on layer of hard metal.

3. A return bend and well for a thermo-sensitive instrument comprising in combination a piece of pipe having a U-shaped passage therein disposed to direct a fluid through a turn, said pipe having a bore connecting said passage to the exterior at a point in the central portion of said pipe, said bore having an outer screw threaded portion and an inner conical seat portion, the axis of said bore being normal to the plane containing the axis of the U-shaped passage, and a well comprising a pipe having a central passage open at its outer end but closed at its inner end secured in said bore with the closed end extending into the passage along the axis of said bore and spaced from the inner wall along the outside radius of said U-shaped passage whereby solid particles in the fluid flowing through said U-shaped passage tend to be carried by centrifugal force in a path out of contact with said well, screw threads on the exterior of said well engaging said screw threaded portion, and a conical surface on the exterior of said well sealing against said conical seat portion.

4. A return bend and well comprising in combination a piece of pipe having a U-shaped passage therein disposed to direct a fluid through a turn, said pipe having a bore connecting said passage to the exterior at a point in the central portion of said pipe, the axis of said bore being normal to the plane containing the axis of the U-shaped passage, and a well comprising a pipe having a central passage open at its outer end but closed at its inner end secured in said bore with the closed end extending into the passage along the axis of said bore and spaced from the inner wall along the outside radius of said U-shaped passage whereby solid particles in the fluid flowing through said U-shaped passage tend to be carried by centrifugal force in a path out of contact with said well, at least that portion of said well extending into said passage being coated with a welded on layer of hard metal.

5. A return bend and well comprising in combination a piece of pipe having a U-shaped pas-

sage therein disposed to direct a fluid through a turn, said pipe having a bore connecting said passage to the exterior at a point in the central portion of said pipe, the axis of said bore being normal to the plane containing the axis of the U-shaped passage, and a well comprising a pipe having a central passage open at its outer end but closed at its inner end secured in said bore with the closed end extending into the passage along the axis of said bore and spaced from the inner wall along the outside radius of said U-shaped passage whereby solid particles in the fluid flowing through said U-shaped passage tend to be carried by centrifugal force in a path out of contact with said well.

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