

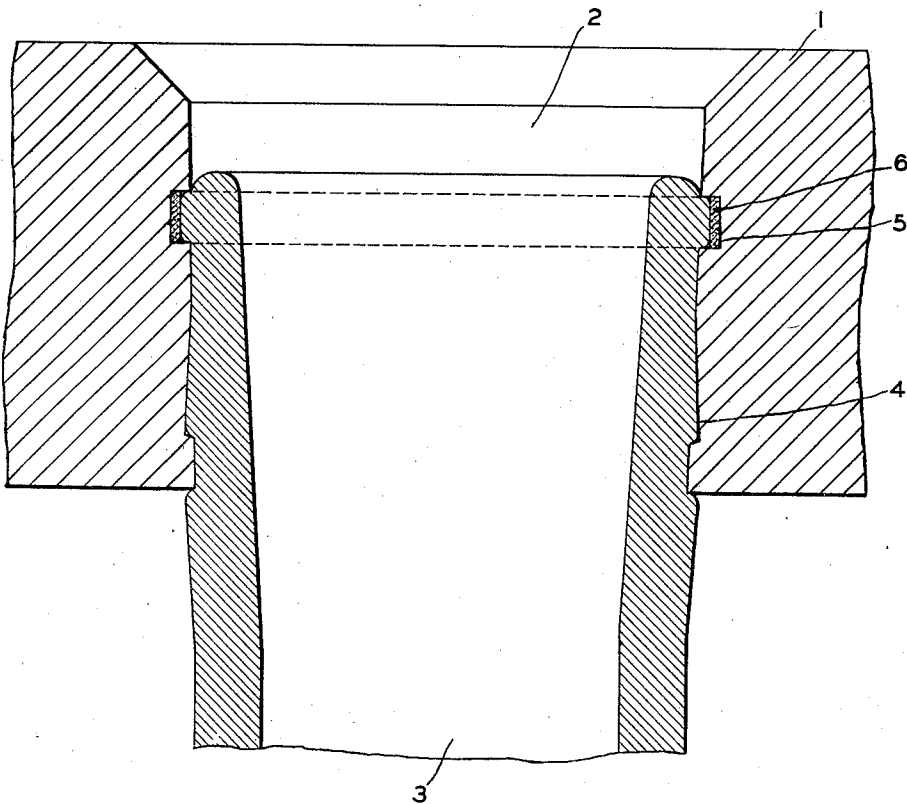
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TUBULAR CONDUIT

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TUBULAR CONDUIT

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1 Claim. (Cl. 285—56)

The invention particularly refers to an improvement in tube headers, return bends and the like of the type wherein metal in the walls of the end of a tubular element is rolled into grooves or recesses provided in the tube port of said header or return bend, said improvement comprising a gasket of resilient material and means for employing the same in at least one of said grooves or recesses whereby to prevent leakage between the walls of the tube and the walls of the tube port, particularly when the assembly is used for high temperature service.

It has long been the practice to secure the ends of the tubular elements of heating coils, heat exchangers and the like to headers, return bends or tube sheets by providing recesses or grooves about the circumference of the tube ports in said headers and expanding the metal walls of the tube into said grooves or recesses by rolling. However, with the advent of processes, such as, for example, thermal polymerization of normally gaseous hydrocarbons, employing extremely high temperatures, difficulties have been encountered in the heating coil due to leakage between the walls of the tube ports and the rolled-in walls of the tube. This trouble is particularly pronounced when metals or alloys having a relatively low coefficient of expansion (such as, for example, high temperature alloy steels employing chromium and/or molybdenum) are utilized for the tubes and when the headers are of different metal such as forged or cast steel or a different steel alloy having a higher coefficient of expansion. I attribute this leakage to the difference in expansion encountered at the high temperatures between the tube walls and the tube headers and to overcome this difficulty have provided one or more relatively deep grooves or recesses into which the metal of the tube walls is expanded by rolling and have provided the same with a gasket of suitable resilient material such as asbestos or an asbestos gasket armored with soft metal such as copper or aluminum. The resilience of this gasket serves to compensate for the small difference in expansion between the tube walls and the walls of the tube port, which causes leakage.

The advantages of the improvement provided by the invention will be apparent to those familiar with the art and it will also be apparent that the improvement provided by the invention is adaptable to practically any type or class of apparatus in which tubular elements are rolled into headers, return bends or tube sheets.

The accompanying drawing shows a longitudinal

section through a portion of a tube and tube header, illustrating one specific application of the features of the invention.

Referring to the drawing, a portion of the tube header is indicated at 1 and is provided with a port 2 which receives the end of a tube 3. The tube port is provided with circumferential recesses or grooves 4 and 5 into which the metal of the tube walls is expanded by rolling the interior surface of the tube walls with a roller or tube expander of any suitable well known form.

The drawing illustrates how the interior surface of the walls at the end of the tube are tapered by the rolling operation and the metal forced into the grooves or recesses 4 and 5. In conventional practice a plurality of grooves similar to that indicated in the drawing at 5 are ordinarily provided but are not as deep as groove 5, so that the metal forced into these grooves by the rolling operation contacts the bottom of the grooves in the same manner as the expanded metal contacts the bottom of groove 4 in the drawing.

In the improved form of apparatus here illustrated, groove 5 is deeper than in conventional practice and is provided with a ring gasket 6 of resilient material, capable of withstanding the temperature conditions to which it is subjected. A gasket composed entirely or principally of asbestos fibre has been found suitable for this purpose and, when desired, the asbestos may be armored with a suitable soft metal such as copper or aluminum, for example. Preferably, however, in order to facilitate insertion of the gasket into the groove, the metal armor or sheath is omitted, permitting the gasket to be deformed slightly from its normal ring shape, so that it may be readily slipped into port 2 and inserted in groove 5.

Upon rolling the tube, gasket 6 is tightly compressed in groove 5 and the resilience of the gasket allows it to expand in case the walls of the tube port expand to a greater degree, upon heating, than the walls of the tube. The gasket thereby serves to maintain a tight joint in groove 5 and prevent leakage between the walls of the tube and the walls of the tube port.

I am aware of the fact that soft metal thimbles, collars, ferrules and the like have previously been employed between the walls of a tube and the walls of a port into which the tube is expanded. I am also aware that it is old in the art to employ packing, inserted in a stuffing box and compressed by means of a packing gland, between the walls of a tubular element and the

walls of fittings such as return bends, expansion joints and the like. The difference in form and function between such apparatus provided by the prior art and that provided by my invention will be readily appreciated. The soft metal collars, thimbles and ferrules are employed either to protect the ends of the tubes from corrosion or the like and/or on account of the ability of the soft metals to be deformed more readily than the harder metal of the tube walls. Soft metal members of this type will not function in the same manner as the resilient gasket provided by this invention, since they are not resilient and when once compressed will not again assume their former shape and size. Packing is used, as above mentioned, particularly to permit lateral expansion rather than circumferential expansion of the tubular element and, although the packing may be of asbestos or other resilient material which, if properly employed, might

function in much the same manner as the resilient gasket provided by this invention, the apparatus of this invention is greatly simplified as compared with apparatus employing packing, a stuffing box, a packing gland and the necessary means for tightening the gland and keeping the packing compressed.

I claim as my invention:

In combination with an apparatus of the class of tube headers, return bends and the like having a port for the reception of a tubular member and a circumferential groove in the metal walls of said port into which metal of the walls of said tubular member is forced, a resilient gasket disposed within said circumferential groove which gasket is adapted to be compressed by expansion of the tube walls and prevent leakage between the latter and the walls of said port.

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