Jan. 19, 1943. C. ADAMS, JR 2,308,482

PIPE FITTING

Filed March 17, 1941

FIG. 1.

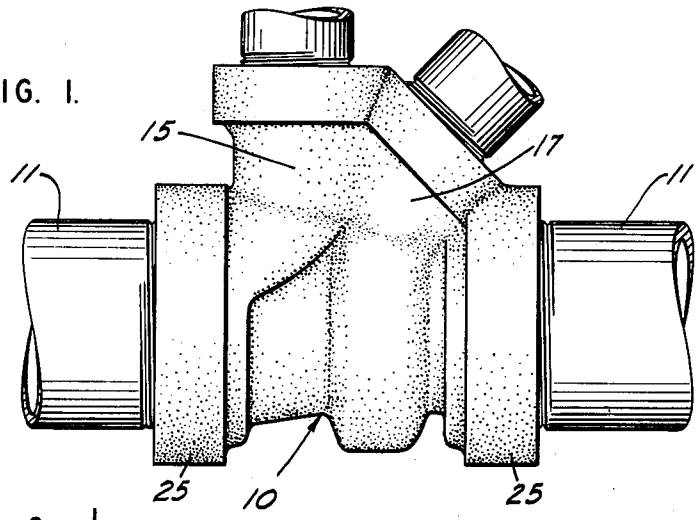


FIG. 2.

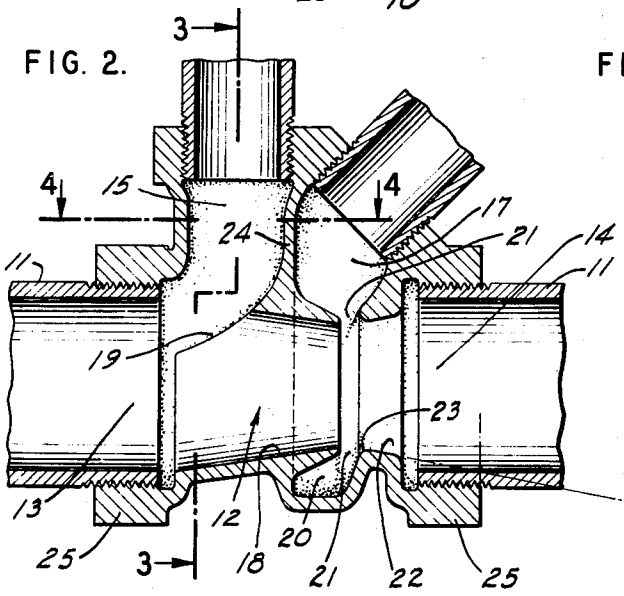


FIG. 3.

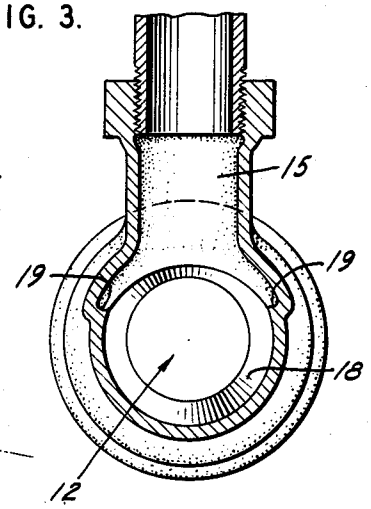


FIG. 4.

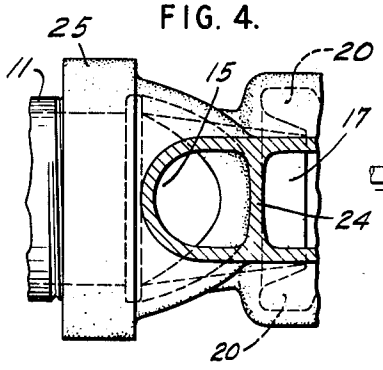
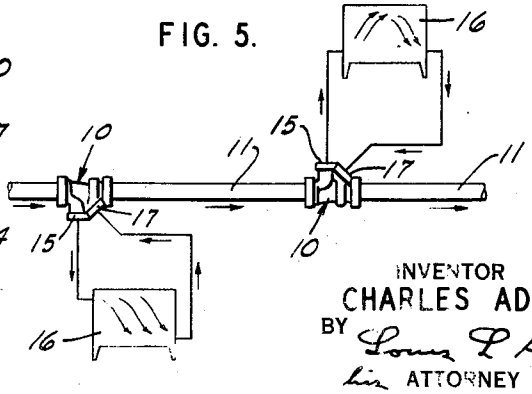


FIG. 5.



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PIPE FITTING

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6 Claims. (Cl. 138—37)

The present invention relates to pipe fittings and more particularly to a novel double-flow fitting especially adapted for use in a circulating main to supply temperature controlling fluid to a heat exchanger or radiator and to receive fluid from the radiator and return it to the main flow in a heat transfer system such as a hot water heating system. Each fitting may be used in connection with a single radiator or with a group of radiators.

It has been proposed heretofore to provide for a single heat-transfer radiator or a group of radiators, a single double-flow fitting through which fluid, such as water, is diverted from the main to said radiator or group of radiators and is later returned to the main. In the prior fittings of this kind, there were many disadvantageous features, for example, the diverting means was such as to cause a considerable amount of frictional resistance, there was very little if any suction produced in the fitting to draw the fluid from the radiator or group into the main, and at different points there were produced substantial eddy currents which interfered with the flow.

An important object of the present invention is to provide a novel and advantageous fitting of the general character described. Another object of the invention is to provide a fitting of the general character described in which the fluid is diverted from the main stream with less frictional resistance than in prior fittings. Another object of the invention is to provide an efficient and compact form of fitting of the general class described. A further object is to provide fittings of the general character described in which various disadvantages heretofore encountered are avoided.

In carrying out the invention, the fitting may be formed with a main passage connecting a main inlet and a main outlet, a supply branch for connection with a radiator and a return branch through which fluid is returned to the fitting to pass into the main. Said main passage may comprise a portion with a reducing taper extending from the main inlet a substantial distance toward the main outlet and an outlet portion with an expanding taper, the adjacent ends of such tapered portions being separated by a circumferential or peripheral slit through which fluid from the radiator may be returned to the main passage from a peripheral chamber receiving fluid from the return branch.

The fluid may be diverted from the inlet end of the main passage by means of a scoop with a substantially U-shaped edge which may be referred to as a knife edge or a splitting edge. The scoop may comprise branches starting at opposite sides of the main passage and curving forwardly and outwardly into the inlet of the supply branch where they merge with a connecting central portion to form part of the wall of the supply branch. In this way there is no obstruction in the passageway except close to its inner surface and the reducing taper may be very gradual thus providing a larger diameter at its exit end and assuring lower friction losses. By means of this scoop the fluid is diverted into the supply branch in a manner depending substantially upon the effect of velocity of flow in the main passage rather than the pressure in the part of the passage adjacent to the inlet. The flow through the supply branch may be aided by injector or Venturi action at the outlet end of the reducing taper.

Due to the manner of diverting fluid into the supply branch and the injector action on the return fluid, the fitting may be used in the most favorable way with both branches pointing upwardly or in other positions including the most unfavorable arrangement in which the supply and return branches point downwardly. Preferably the return branch is located behind the supply branch thus enabling the fitting to be made very compact. In view of the low resistance of this fitting, a larger number thereof may be used than of fittings in which the resistance is greater. The arrangement is such as to avoid the production of objectionable eddy currents. Another advantage of the fitting of the present invention is that the resistance to flow therethrough is reduced and is very small in the event that the flow through the supply branch and the return branch is shut off.

Other objects, features and advantages will appear upon consideration of the following description and of the drawing in which:

Fig. 1 is a view in elevation of one form of fitting embodying the present invention;

Fig. 2 is a longitudinal section through the axes of the supply and return branches;

Fig. 3 is a section taken along the line 3—3 of Fig. 2;

Fig. 4 is a section taken along the line 4—4 of Fig. 2; and

Fig. 5 is a diagrammatic view showing the fittings in use in the most favorable and most unfavorable positions.

Referring to the drawing, there is illustrated in Figs. 1, 2, 3 and 4 a fitting 10, embodying the

present invention. Said fitting is connected in a main 11 and the fluid as indicated by the arrows of Fig. 5, flows from left to right through the fitting as illustrated in Figs. 1 and 2. The fitting is of the double flow type and has a main passage 12 from main inlet 13 to main outlet 14, a supply branch 15 to supply fluid from the inlet end of the main passage to a radiator 16 or group of radiators, and a return branch 17 through which fluid, after passing through the radiator or radiators, is returned to the main passage near the main outlet. The flow through a radiator connected with a fitting of this kind is illustrated in Fig. 5.

The main passage 12 has a portion 18 with a reducing taper extending from the main inlet toward the main outlet and serving by increasing the resistance to increase the pressure at the inlet of the supply branch and to force fluid out through the supply branch. However, there is also provided novel flow-diverting means in the form of a U-shaped knife-edge scoop comprising branches 19 starting from the inlet end of the reduced taper portion or nozzle at opposite sides of the main passage and extending forwardly and outwardly, and toward each other until they merge at the surface of said passage with each other and the forward side of the inner surface of the supply branch. It will be seen (Figs. 3 and 4) that the U-shaped knife-edge thus provided splits off a shallow stream from the main flow. By combining the tapered nozzle or reducing taper with the scoop, a positive flow through the supply branch is assured.

The return branch 17 is so placed in the fitting that the return fluid enters the main stream or flow just beyond the smaller forward end of the tapered portion 18. To distribute the return fluid around the main passage, there may be provided a chamber 20 of generally annular form discharging into the main passage through a peripherally or circumferentially arranged slit 21, the walls of the chamber 20 being so arranged as to direct the flow forwardly through the slit 21.

Just beyond the reduced end of the tapered portion 18, at the opposite side of the slit 21, is a portion 22 of the main passage, having an expanding taper. The rear end of the tapered portion 22 may be of somewhat greater diameter than the forward end of the tapered portion and its rear end may be rounded at 23 to provide for a smoother flow. By means of the expanding taper adjacent to the main outlet, counter currents at the discharge end of the reducing-taper portion of the main passage are avoided.

It will be evident that, as a result of the arrangement at the main outlet, there will be exerted a Venturi or injector action, thus producing a suction on the return branch and increasing the flow created through the supply branch by means of the scoop.

Although the return branch may be arranged in different positions around the axis of the main passage with reference to the supply branch 15, preferably the return branch is directly behind the supply branch longitudinally of the main passage and is separated from the supply branch by a substantially flat wall 24, thus enabling the fitting to be made very compact both longitudinally and laterally.

As best shown in Fig. 3, the branches 19 of the scoop are preferably formed as the shelf-like bottoms of recesses in opposite sides of the entrance end of the nozzle or reducing taper portion of the main passage.

Due to the design of fitting 10, it may be turned to any position about the axis of the main inasmuch as the motive force does not depend upon the position of the fitting but on the manner of deflecting the fluid into the supply branch and the drawing of fluid out of the return branch. It will be understood that the position of the fitting shown at the right of Fig. 5 is the most favorable one.

The preferred form of fitting enables the fitting to be very compact and suitable for use in restricted space. Also the arrangement of branches facilitates the connection of pipes thereto.

As illustrated in Fig. 2 the various pipes attached to the fitting have screw-thread connections therewith, the sections of the main, 11, at opposite ends of the fitting being screwed into internally threaded beads 25. At the main inlet the interior diameter of the larger end of the reducing taper is preferably somewhat larger than the internal diameter of the main. At the main outlet of the fitting the discharge end of the expanding taper 22 should be less in internal diameter than the main and the taper should be such that fluid passing therefrom would strike the inner surface of the main substantially at the plane of the outer face of the bead, thus preventing the fluid from striking the end of the main irrespective of the extent to which the main is screwed into the fitting.

In the usual system, there is a fitting through which fluid is supplied to a radiator or a riser connection, and a T through which the fluid is returned to the main. The double flow fitting of the present invention eliminates the separate return T and reduces resistance or friction in the system. Furthermore, by providing suction in the return branch of my double flow fitting in connection with my means for diverting fluid from the main to the supply branch, I provide for a reduction of resistance as compared with prior double flow fittings.

The knife edge U scoop of the present invention cuts off and deflects a portion of the main flow into supply branch to a radiator or radiators or risers with sufficient force or velocity to supply the necessary heat units to the radiator without appreciable change of the temperature. This gives maximum radiation efficiency with less back pressure against force producing circulation.

A further force to speed flow in the main is developed in the remainder of the reduced taper or nozzle and this effects an increased pull in the return branch thus aiding the deflecting force in producing a flow at greater velocity through the radiator, thus tending to partially overcome the resistance created by branches and radiators. Also, if branch flow is reduced, the resistance or friction in the fitting is reduced and if the supply branch is shut off, there is greatly reduced resistance through the fitting and consequently much less back pressure on the circulator or pump.

Although the slit 21 is disclosed as extending completely around the main passage 12, it should be understood that, if desired, the slit might be closed at the outlet of the return branch and still give satisfactory results.

It should be understood that various changes may be made and that certain features may be

used without others without departing from the true spirit and scope of the invention.

What I claim is:

1. A pipe fitting comprising a body having a main inlet and a main outlet in opposed positions for connection in a circulating main of a heat-transfer system, a main passage connecting said main inlet and main outlet, a supply branch leading from said main passage near said main inlet to supply a radiator, means for diverting fluid from the inlet end of said main passage to said supply branch including a restricted portion of said main passage and recesses at opposite sides of the main passage providing shelves starting at the sides of the main passage and extending forwardly and outwardly of said main passage until they meet at the surface of the main passage and the far side of said supply branch thus providing a U-shaped splitting edge, a return branch behind said supply branch longitudinally of said main passage, and means adjacent said return branch for drawing fluid from said return branch into the discharge end of said main passage for discharge from the fitting.

2. A pipe fitting comprising a body having a main inlet and a main outlet in opposed positions for connection in a circulating main of a heat-transfer system, a main passage having a reducing taper from said main inlet toward said main outlet, a supply branch curving away from the axis of said main passage at the larger end of such tapered portion of the main passage, and means for diverting fluid from the adjacent side of said main passage into said supply branch including such reducing taper and a knife-edge U scoop comprising recessed shelves at the sides of the tapered portion of the main passage curving forwardly and outwardly into the inner end of the supply branch where they merge with a connecting central portion.

3. A pipe fitting comprising a body having a main inlet and a main outlet in opposed positions for connection in a circulating main of a heat-transfer system, a main passage having a reducing taper from said main inlet toward said main outlet, a supply branch having its inlet in the side of said main passage near the main inlet and curving away from the axis of said main passage and means for diverting fluid from the adjacent side of said main passage into said supply branch through its inlet including a knife-edge U recessed scoop comprising branches at the sides of the tapered portion of the main passage curving forwardly and outwardly into the inlet of the supply branch where they merge with a connecting central portion which forms part of the wall of the supply branch.

4. A pipe fitting comprising a body having a main inlet and a main outlet in opposed positions for connection in a circulating main of a heat-transfer system, a main passage having a reducing taper from said main inlet toward said main outlet and an expanding taper to said outlet, a supply branch having its inlet in the side of said main passage at the large end of said reducing taper, a return branch with its inner end adjacent the connection between the tapered portions of said passage, a chamber connected to the inner end of said return branch and extending around the main passage with which it is connected by a circumferentially-extending slit between said tapered portions, said main outlet being provided with an internally screw threaded bead to receive a pipe of greater internal diameter than the internal diameter of the outer end of the expanding taper and the expanding taper having such an inclination that the fluid passing therefrom will strike the inner surface of said pipe adjacent the outer side of said bead.

5. A pipe fitting comprising a body having a main inlet and a main outlet in opposed positions for connection in a circulating main of a heat-transfer system, a main passage having a reducing taper from said main inlet toward said main outlet and at said main outlet an expanding taper with its rear end adjacent to the forward end of the reducing taper and separated therefrom by a slot, a supply branch curving away from the axis of said main passage through the side thereof, means for diverting fluid from the adjacent side of said main passage into said supply branch including a knife-edge U scoop comprising branches recessed in the sides of the main passage and curving forwardly and outwardly with reference to the axis of the main passage into the inlet of the supply branch where they merge with a connecting central portion, a peripherally arranged chamber opening into said slot, and a return branch supplying fluid returned from said radiator to said chamber to be drawn into the main passage.

6. A pipe fitting comprising a body having a main inlet and a main outlet in opposed positions for connection in a circulating main of a heat-transfer system, a main passage having a reducing taper from said main inlet toward said main outlet and at said main outlet an expanding taper with its rear end adjacent to the forward end of the reducing taper and separated therefrom by a slot, a supply branch curving away from the axis of said main passage through the side thereof, means for diverting fluid from the adjacent side of said main passage into said supply branch including a knife-edge U scoop comprising recessed branches at the sides of the main passage curving forwardly and outwardly from the axis of the passage into the inlet of the supply branch where they merge with a connecting central portion, a peripherally arranged chamber opening into said slot, and a return branch supplying fluid returned from said radiator to said chamber to be drawn into the main passage by suction, the return branch being behind the supply branch and separated therefrom by a single wall.

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