United States Patent [19]

Young

[11] **3,846,892**

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[54] **EXTRACTOR TOOL FOR HEAT-EXCHANGER CORE**

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[73] Assignee: **Young Radiator Company,** Racine, Wis.

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[52] **U.S. Cl.** ..... **29/202 R,** 29/234, 29/259, 29/282

[51] **Int. Cl.** **B23p 19/04**

[58] **Field of Search** ..... 29/234, 256, 258, 259, 29/260, 261, 266, 282, 202 R; 254/98

[56] **References Cited**

UNITED STATES PATENTS

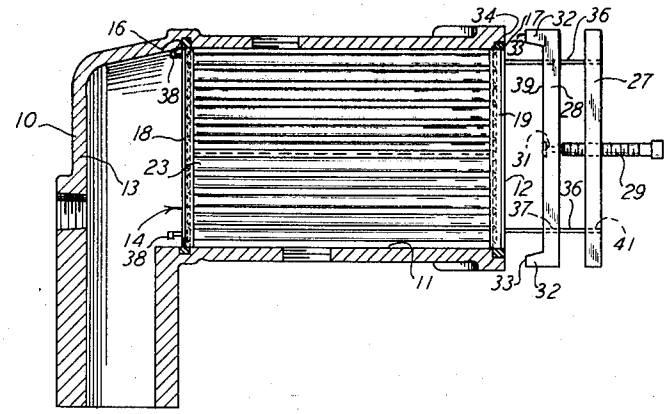
1,405,253	1/1922	Bainbridge	29/259
1,469,076	9/1923	Faber	29/259
1,607,957	11/1926	Koehler	29/261
2,441,756	5/1948	De Swart	29/282

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Attorney, Agent, or Firm—Arthur J. Hansmann

[57] **ABSTRACT**

An extractor tool for use in extracting a heat-exchanger core from a casing, wherein the tool has two members threaded together for controlled separation thereof, and two spring fingers are connected to the members and extend away from the members for insertion into tubes in the heat exchanger core. The extending ends of the spring fingers have feet or offset portions which hook onto the remote ends of the tubes and can then pull on the exhanger core when the screw is turned and the fingers are pulled toward the members. Also, one of the members spans the core and has abutment surfaces which engage the casing surrounding the core for holding the members and permitting the retraction of the fingers and the core to release the core from the casing.

4 Claims, 5 Drawing Figures



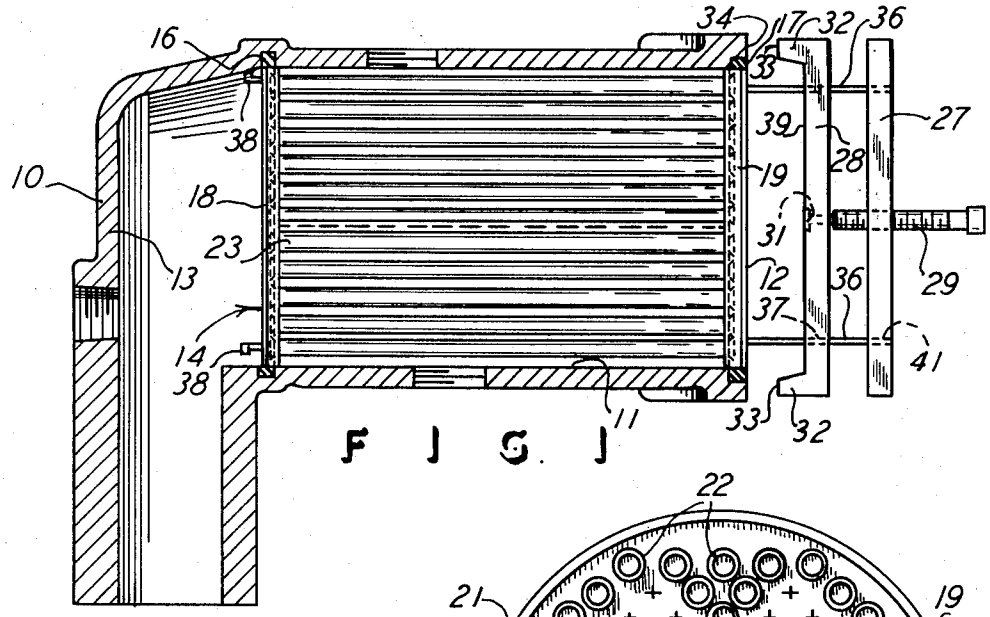


FIG. 1

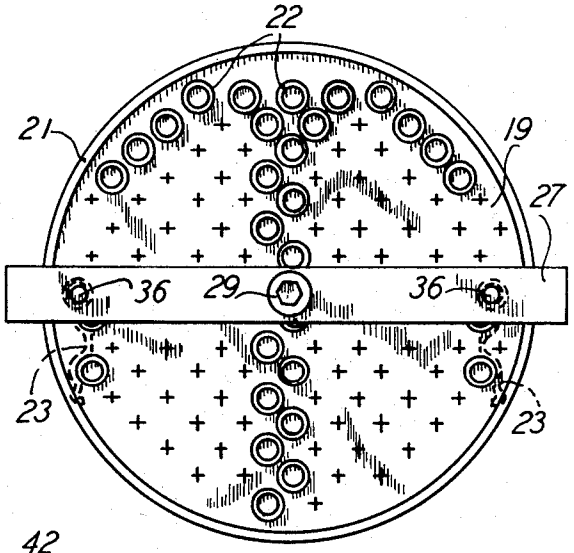


FIG. 2

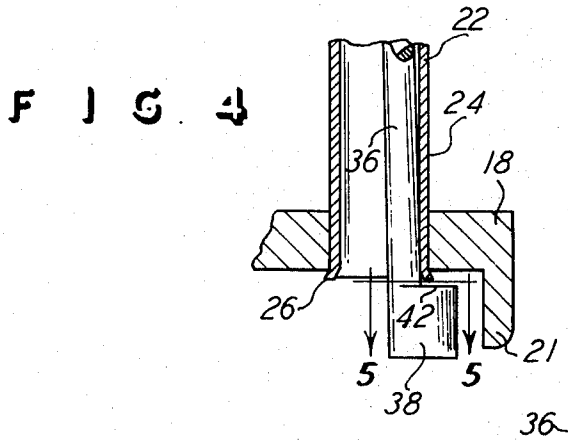


FIG. 4

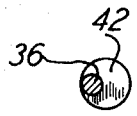


FIG. 5

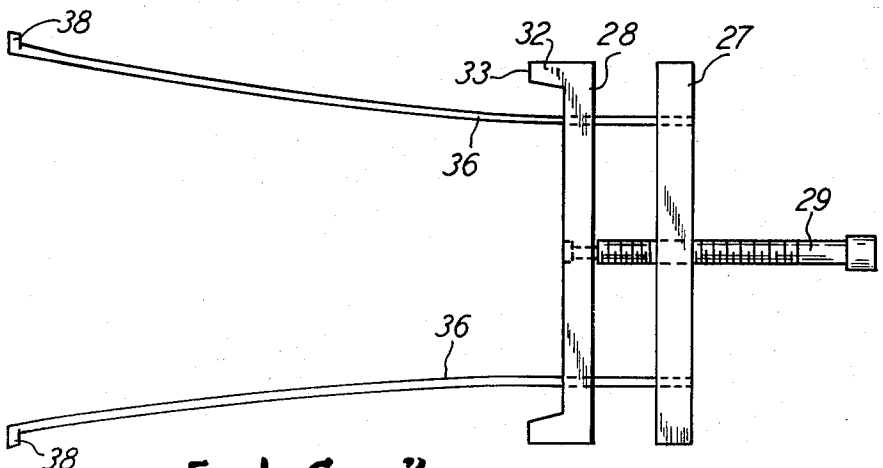


FIG. 3

EXTRACTOR TOOL FOR HEAT-EXCHANGER CORE

This invention relates to an extractor tool for use in extracting a heat-exchanger core from a casing which permits exposure of only one end of the core, and with the opposite end of the core being in a blind opening in the casing.

BACKGROUND OF THE INVENTION

Heat-exchanger cores are commonly constructed to have liquid carrying tubes and baffles to provide the usual shell and tube type of core for an oil-to-water oil cooler type of heat exchanger, as one example. In this type of heat-exchanger, the core is commonly disposed within a casing or housing which has a blind hole so that only one end of the core is exposed when the disassembly of the exchanger is under way. Therefore, with only one end of the core being accessible or exposed, the core cannot be removed from the casing without special operations or tools. Further, the core is commonly seated in the blind hole and is surrounded by fluid sealing members, such as O-rings, and these sealing members tend to bind the core to the casing and thus further impede the removal of the core from the casing. An example of this type of heat-exchanger is seen in U.S. Pat. No. 3,134,431 wherein the casing surrounding the core is shown to have the usual blind hole, and thus the core cannot be removed from the casing, and the shown O-rings further tend to hold the core in the casing.

Of course the prior art is also aware of tools for extracting one assembled piece relative to another piece, and U.S. Pat. No. 2,690,613 shows one example of a tool for use in the heat-exchanger art.

In view of the problem mentioned above, the present invention provides an extractor tool which efficiently permits the removal of the core from the heat-exchanger casing, and it effects this function without any damage to the core. That is, when it is desired that the core be removed, such as for repair, inspection, replacement, or the like, then the present invention provides an extractor tool for effecting the function of removing the core.

Another object of this invention is to provide an extractor tool of the type mentioned and wherein the tool is readily and easily provided, without undue and excessive expense, and wherein the tool can be readily and easily used without damaging the exchanger. Still further, it is an object of this invention to provide an extractor tool which can be easily altered to adapt to exchanger cores of varying dimensions so that cores of different lengths, for instance, can be removed by the interchange of only a few parts in the tool of this invention.

Other objects and advantages will become apparent upon reading the following description in light of the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a sectional view showing a heat-exchanger and the tool of this invention applied thereto.

FIG. 2 is an end view of the tool and heat-exchanger core seen in FIG. 1, but being slightly enlarged therefrom.

FIG. 3 is a side elevational view of the tool shown in FIG. 1.

FIG. 4 is an enlarged sectional view of the corner of the heat-exchanger core and the tool portion applied thereto.

FIG. 5 is a sectional view, on a reduced scale, taken along the line 5—5 of FIG. 4.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. 1 shows the heat-exchanger in a sectional view and being of the construction as shown in U.S. Pat. No. 3,134,431. The exchanger includes the housing or casing **10** having the blind opening **11** which has an open end at the end designated **12** and which has a wall designated **13** which presents the partition or block thus forming the blind opening **11.** Further, it will be seen and understood that the exchanger includes the heat-exchanger core **14** disposed within the housing opening **11** and being surrounded by the usual O-rings **16** and **17** at opposite ends of the core **14.**

With the exchanger as shown in FIG. **1,** it will be understood that the core **14** cannot be readily removed from the casing **10** because of the lack of common access to the core **14** for withdrawing it from the casing **10.** Further, it will be understood that after the heat-exchanger has been in use for some time and has been subjected to mechanical and fluid pressures and to heat, the core **14** tends to bind in its position in the housing **10** and this further hampers removal of the core **14.** That is, the core **14** is actually forced into the housing **10** in the assembly of the heat-exchanger, and the O-rings or seals **16** and **17** bind on the core header plates **18** and **19** which are circular plates having rims **21** endlessly and snugly disposed relative to the O-rings **16** and **17.**

FIGS. **1** and **2,** as well as the cited patent, further disclose that the core **14** includes the circular header plates **18** and **19,** at opposite ends of the core **14,** and it includes the plurality of liquid carrying tubes **22** which have their opposite ends fluid tightly bonded to the respective header plates **18** and **19,** in the usual manner. FIG. **2** shows some of the tubes **22,** and the drawing also shows the location of the remainder of the tubes **22.** Further, the core **14** includes baffle plates **23** which extend between the header plates **18** and **19** for directing the flow of engine oil across the tubes **22.** It will therefore be understood that a heat-exchange liquid, such as water in this instance, can flow through the plurality of tubes **22,** and another heat-exchange medium, such as oil, can flow across the tubes **22,** all in a conventional and well-known manner for providing an oil cooler or other form of any commonly known heat-exchanger. FIG. **4** further shows a portion of the header plate **18,** and it also shows a remote end **24** of one of the exchanger tubes **22.** Here it will be seen that the tube extreme end **26** is flared outwardly and is physically connected with the header plate **18** to be permanently attached thereto and to be fluid-tight therewith so that the tubes **22** and the plates **18** and **19** form a pre-assembled unit of the heat-exchanger core **14.**

The extractor tool of this invention is shown to include members **27** and **28** which are bar-shaped members and which are shown to be connected together through a screw **29** which threadedly extends through the member **27** and which has a rotatable but permanent connection with the member **28** at the screw end **31.** Thus, upon rotation of the screw **29,** the members **27** and **28** move relative to each other, and the screw

end 31 can rotate in the member 28 but retains its connection with the member 28. The members 27 and 28 are therefore rigid members which are capable of withstanding forces without deflecting, and the member 28 has two spaced-apart feet or projections 32 which terminate in bearing surfaces 33 faced toward the heat-exchanger end surface 34. Thus, it will be seen and understood that the bearing surfaces 33 can be brought into contact with the casing circular surface 34 to locate and hold the member 28 against the casing 10. Of course then rotation of the screw 29 in the proper direction will cause movement of the member 27 away from the member 28, and such movement causes movement of two spring fingers or probes 36 which are attached to the member 27. The fingers 36 therefore have one end of each thereof attached to the member 27 and the spring fingers 36 extend through openings at 37 in the member 28 and the fingers 36 are snugly slidably disposed through the openings 37 to be guided by the member 28.

The fingers 36 have their extending ends terminating in feet or offset portions 38, and the drawings show that these offset portions 38 extend offset to only one side of each finger 36, and FIG. 3 shows that the feet 38 extend in directions opposite from and therefore away from each other. Further, the fingers 36 are made of a resilient material, such as spring steel, and they are normally curved outwardly, as seen in FIG. 3 toward the sides of the locations of the projections or offsets 38. Of course the fingers 36 are capable of withstanding tensile forces, and they are also capable of flexing inwardly toward each other.

With the extractor tool as described, the tool can be applied to the exchanger core 14 by inserting the probes or fingers 36 into two of the tubes 22, and the fingers can be inserted until they both attain the position shown in FIG. 4, namely, until the offset portions 38 of both fingers 36 extend beyond the two tube ends 26. By reason of the natural outward curvature of the fingers 36 and the spring or flexible nature of the fingers 36 as they are shown in their unstressed position in FIG. 3, the offset portions 38 will be positioned to hook onto the two tube ends 26, as seen in FIG. 4. It will then further be understood that turning of the screw 29 will cause the withdrawal of the fingers 36 and thus the core 14 will be pulled through the bearing contact of the finger portion 38 on the tube ends 26 to withdraw the core 14 from its casing 10. Of course the core 14 can be moved axially of itself and toward the member 28 which is in bearing contact with the casing surface 34 up to the movement where the core header plate 19 would abut the surface 39 of the member 28. That is, the legs 32 of the member 28 extend away from the body of the member 28 and beyond the surface 39 to provide clearance for the initial movement and withdrawal of the core 14. Beyond that point of initial withdrawal of the core 14, the entire core can be withdrawn by grasping the member 27 which is now spaced from the member 28, and the core 14 can be withdrawn by manual retraction of the core 14 from the casing 10 as provided by the arrangement of the members 27 and 28 and the availability of the member 27 to be gripped by the operator.

With the use of the extractor tool, the core is readily withdrawn from a usually extremely snug and virtually affixed position in the casing 10, but there is no damage to the core itself. Further, the tool can be readily released from the core by simply positioning the member 38 so that they can again slide along the tubes 22 and be withdrawn therefrom, and such withdrawal can even be effected even though the core 14 was not withdrawn from the casing. That is, the spring fingers 36 could actually be flexed inwardly to release the portions 38 from overlapping the tube ends 26, since the size of the fingers 36 is less than the internal diameters of the tubes 22, as seen in FIG. 4.

Further, it will be readily seen and understood that since the spring fingers 36 are simply threaded into openings designated 41 in the member 27, the fingers 36 can be replaced by fingers of longer or shorter length, for accommodating different lengths of cores 14. Also, it will of course be understood that the fingers 36 will be inserted into any two tubes 22 which are spaced apart essentially at the spacing of the fingers 36 adjacent the membeer 28, as indicated in FIG. 2, and the opposite ends of the fingers 36 will then naturally expand or flex to where the hook portions or offsets 38 engage the respective tube ends 26, as seen in FIG. 4. Of course FIG. 1 shows the tool applied to the exchanger but in a position prior to the tightening of the screw 29 and the consequent seating of the feet 32 on the wall 34, and therefore also prior to pulling the shoulders 42 of the tool feet 38 against the respective tube edges 26.

What is claimed is:

1. An extractor tool for use in extracting from a casing a heat exchanger core which has elongated heat-exchange tubes and a header plate at each axial end of said tubes, comprising two rigid members with one of said members having two spaced-apart bearing surfaces offset from the remainder of said one member and disposed at the opposite ends thereof for the purpose of spanning said core and being in contact with said casing only, a screw extending between said members for moving them apart in response to rotation of said screw in one direction, two elongated fingers attached at one end of each thereof to the other of said members and slidably extending through said one member and therebeyond and being of a spring material to be flexible in the extending portions in the directions transverse to the length of each of said fingers, and an offset portion on the extending end of each of said fingers and with said offset portions respectively extending to only one side of each of said fingers and extending in opposite directions relative to each other and being offset in said transverse directions for the purpose of hooking onto a remote end of said heat-exchange tubes when said fingers are inserted into said tubes.

2. The extractor tool as claimed in claim 1, wherein said fingers are uniformly curved along their entire lengths which extend beyond said other member, and each said offset portion is disposed on the respective said fingers to the side thereof toward which the said fingers are curved.

3. The extractor tool as claimed in claim 2, wherein said fingers are removably secured to said members, for permitting removal and replacement of said fingers.

4. The extractor tool as claim 1, wherein one end of said screw extends into said one member for connecting said members together.

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