Sept. 10, 1940. C. W. ALBERTSON 2,214,648

JOINT AND METHOD OF MAKING SAME

Filed July 13, 1938

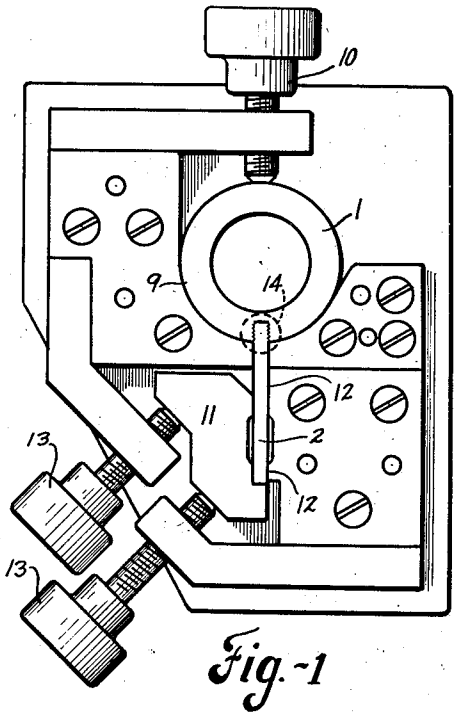


Fig.-1

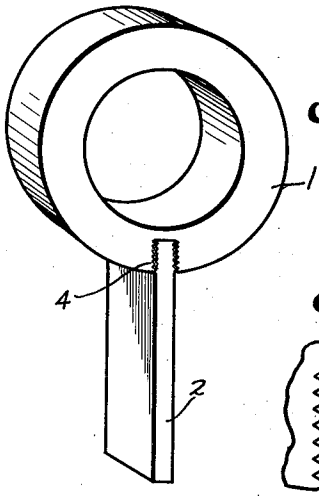


Fig.-2

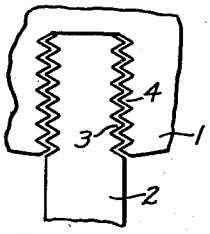


Fig.-3

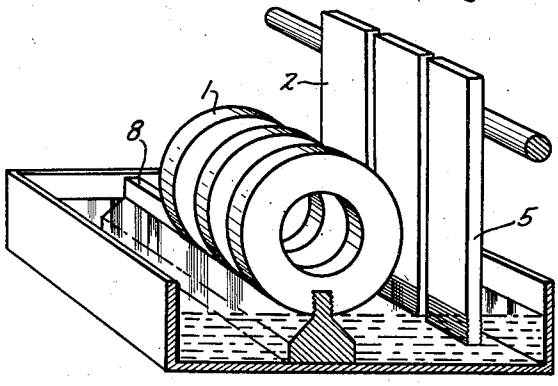
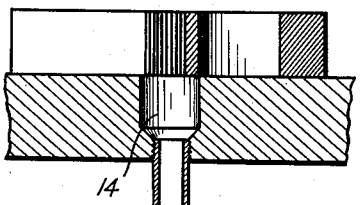


Fig.-6



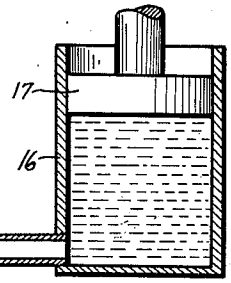
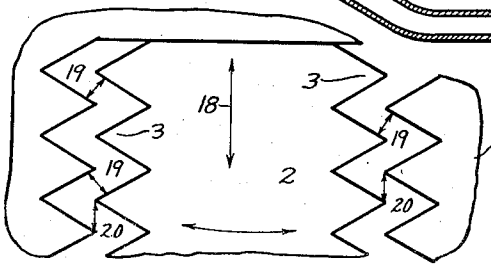


Fig.-5

Fig.-4



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JOINT AND METHOD OF MAKING SAME

Carl W. Albertson, Chicago, Ill.

Application July 13, 1938, Serial No. 218,941

12 Claims. (Cl. 22—203)

This invention pertains to a method of fixedly uniting mechanical elements in accurately assembled relation and to the resulting structure produced thereby. For illustrative purpose, but without intent to unduly limit the scope or application of the invention, it is herein shown and described as applied to the assembly of a compressor element of a rotary compressor or pump wherein a radially projecting vane is fixedly secured to an annulus exactly in an axial plane thereof, but obviously the method herein described is applicable to union of other elements and production of other devices and is therefore not limited to the specific details nor structure shown.

The object of the invention is to provide means and a method of joining initially separate members in predetermined relation, which may not only be economically practiced but which will produce a joint of great strength and durability and which may be easily and quickly performed by workmen of ordinary skill.

A further object of the invention is to provide an interlocking joint wherein disengaging strain to which the connected parts may be subjected will induce compressive tension within the joint.

A further object of the invention is to provide an interlocking joint which will strongly resist disengagement and which may be easily performed without disturbance or disarrangement of the parts from their pre-arranged relation.

A further object of the invention is to provide means and a mode of operation by which two parts may be interconnected in pre-arranged accurately related positions.

A further object of the invention is to provide an assembly of parts having the advantageous structural features and the inherent meritorious characteristics herein mentioned.

With the above primary and other incidental objects in view as will more fully appear in the specification, the invention intended to be protected by Letters Patent consists of the features of construction, the parts and combinations thereof, and the mode of operation, or their equivalents, as hereinafter described or illustrated in the accompanying drawing.

Referring to the accompanying drawing, wherein is shown the preferred but obviously not necessarily the only form of embodiment of the invention,

Fig. 1 is a top plan view of a jig or fixture wherein a compressor annulus and a radial vane to be fixedly united thereto are held in their adjusted relation preparatory to being united.

Fig. 2 is a perspective view of the interconnected elements.

Fig. 3 is an enlarged detail view of the resulting joint.

Fig. 4 is a diagrammatic view illustrating the stress reaction.

Fig. 5 is a detail sectional view, somewhat diagrammatic, illustrating the manner of filling the joint with molten metal.

Fig. 6 is a perspective view illustrating the preparatory treatment of the parts to be joined.

Like parts are indicated by similar characters of reference throughout the several views.

The article selected for illustration of the herein described method as shown in Fig. 2 comprises the compressor element of a rotary compressor or pump structure shown and described in my copending application for Letters Patent, Serial No. 68,188, filed March 11, 1936, and consists of an annulus 1 having flat opposite faces and a radially disposed flat vane 2, which it is desired be placed exactly in the axial plane of the annulus. Incident to its use in the compressor the element shown in Fig. 2 is subjected to to and fro lateral strain upon the vane 2 and to alternate compression and tension thereon as the annulus performs a gyratory motion through a circular orbit.

In carrying out the method of joining the vane and annulus a slot is formed in the periphery of the annulus to receive the end of the vane 2. The end of the vane to be inserted is transversely corrugated or grooved to form a succession of angular beads 3 thereon. The inner faces of the slots are correspondingly corrugated, affording like angular beads or ribs in registering relation with those of the inserted end of the vane, but spaced therefrom to afford an intervening zig-zag space. Before being assembled, the slotted portion of the annulus and the corrugated extremity of the vane are cleaned in a pickling bath or acid wash to remove all grease and adherent foreign matter. The cleaned surfaces are then preferably tinned or coated with a metallic alloy by inserting the ends of the vane directly into a bath of molten metal as shown at 5 in Fig. 6. At the same time the annuli 1 are disposed on a metallic bar submerged in the molten metal bath in such relation that the metal will enter by capillary attraction between the supporting bar 8 and the interior corrugated faces of the slots, thereby coating such surfaces.

The respective members having been suitably pretreated they are placed in the fixture shown in Fig. 1, which is so shaped and arranged as to

securely hold the annulus and vane in properly adjusted relation with each other. The annulus 1 is held to a concave seat 9, with its slot positioned to receive the vane, by a pressure screw 10. The vane with its end inserted in the slot is held in an exact radial position relative to the annulus and coincident with the axial plane thereof by the pressure block 11, which engages the vane 2 and clamps it against the gauge surface 12 under influence of the pressure screws 13.

The slot in the periphery of the annulus being of somewhat greater width than the inserted portion of the vane 2 leaves therebetween a zig-zag space to be filled with spelter. This may be done by heating the interior of the annulus opposite the vane 2 by a blow torch flame and thereafter melting the spelter on top of the joint and allowing it to flow thereinto. However, the preferable method of filling the joint with molten metal is that illustrated in Fig. 5 wherein an opening 14 is provided in the fixture immediately beneath the position of the joint when the parts are assembled. Such opening in the fixture is connected by a conduit 15 with a crucible 16 in which molten metal is contained and wherein the molten mass is subject to pressure, as for example, by the depressible plunger or piston 17. While such apparatus is shown only diagrammatically in the drawing, it is quite analogous to ordinary die casting apparatus and method and will be well understood by those familiar with such die casting practice. The annulus and vane having been assembled in the fixture in their proper relation, pressure being applied to the mass of molten metal within the crucible 16, the metal is forced under pressure upward through the conduit 15 to the opening 14 and thence through the intervening zig-zag space or crevice between the inserted end of the vane and the adjacent faces of the slot or socket.

Upon cooling the vane is securely and accurately affixed to the annulus.

In the event of lateral pressure in either direction, as indicated by the arrows 18 in Fig. 4, the interposed stratum of metal between the vane and the side of the annulus slot is subjected to compression as shown by the arrows 19. In the event of tension or compression in the plane of the vane such interposed stratum of metal is again subjected to compression as indicated by the arrows 20. The relation of the interposed stratum of metal serves to fixedly interlock the vane and annulus and materially increases its resistance to strain and detaching influence.

While the invention is here shown as applied to an annulus and vane of a compressure structure, it is to be understood that the same method is applicable to the connection of other members of different shapes and for different purposes.

From the above description it will be apparent that there is thus provided a device of the character described possessing the particular features of advantage before enumerated as desirable, but which obviously is susceptible of modification in its form, proportions, detail construction and arrangement of parts without departing from the principle involved or sacrificing any of its advantages.

While in order to comply with the statute the invention has been described in language more or less specific as to structural features, it is to be understood that the invention is not limited to the specific features shown, but that the means and construction herein disclosed comprise the preferred form of several modes of putting the invention into effect, and the invention is therefore claimed in any of its forms or modifications within the legitimate and valid scope of the appended claims.

Having thus described my invention, I claim:

1. The herein described method of assembling an annulus and radial vane, including providing in the periphery of the annulus a transverse slot, the sides of which are indented, indenting the opposite faces of the terminal portion of the vane to be received in the slot of the annulus, clamping the annulus and the vane in adjusted relation in a fixture wherein the indented end of the vane is held in spaced relation within the slot, affording therebetween passages of irregular contour, and projecting molten metal under pressure through an opening in the fixture coincident with the position of the slot into the passages of irregular contour intermediate the vane and annulus.

2. The herein described method of assembling two metallic parts to be interconnected, including providing in one of the parts a recess having indented faces, the recess being of greater size than the portion of the part to be received therein, and indenting the portion of the companion part to be received therein, assembling the respective parts with the inserted portion of the one part in spaced relation with the faces of the recess in the other part, clamping the parts in adjusted relation in a fixture having a hole therein communicating with the recess and discharging molten metal under pressure through such hole into the recess about the inserted portion of the companion part and forming thereby an interposed stratum of metal.

3. The herein described method of joining companion parts, including providing a recess in one part into which a portion of the other part is loosely insertable in relatively spaced relation, indenting adjacent faces of the recess and inserted portion of the companion part, thereby forming an intervening passage of irregular contour and flowing a stratum of molten metal into such irregular passage, the resulting construction and arrangement being such that upon lateral strain the interposed stratum of metal is subjected to compression at opposite sides of the inserted portion and likewise subjected to compression strain upon tension or compression strain in aligned relation with the inserted portion of such companion part.

4. The herein described method of assembling a compressor unit comprising an annulus and a radial vane projecting therefrom, including providing a transverse slot in the periphery of the annulus, of greater size than the portion of the vane to be received therein, corrugating the opposite faces of the slot, correspondingly corrugating opposite faces of the portion of the vane to be inserted in the slot, holding the parts in relatively adjusted relation with the corrugations of the vane and those in the faces of the slot in substantially parallel relation to afford therebetween a zig-zag passage and flowing molten metal into the zig-zag passage.

5. The herein described method of uniting an annulus and a radial vane, including providing a recess in the periphery of the annulus of greater width than the corresponding dimension of the portion of the vane to be received therein, inserting a terminal portion of the vane therein and holding the inserted portion in spaced relation with at least one side of the recess to afford therebetween a restricted space, and flowing molten metal into such space.

6. The herein described method of uniting an annulus and a radial vane including providing a recess in the periphery of the annulus of greater width than a portion of the vane to be inserted, corrugating at least one interior face of the recess, corrugating at least one face of the portion of the vane to be inserted in the recess, holding the corrugated faces of the annulus recess and of the vane in relatively spaced relation and flowing molten metal into such intervening space.

7. As an article of manufacture, an annulus, a radially disposed vane carried thereby, the attached extremity of which intersects the periphery of the annulus and a zig-zag stratum of metal interposed between the annulus and inserted portion of the vane by which the vane and annulus are fixedly anchored one to the other.

8. As an article of manufacture, a compressor element for a rotary compressor comprising an annulus and a radially disposed vane projecting therefrom and disposed in the axial plane of the annulus, said annulus having initially a recess in its periphery into which the end of the vane is projected in relatively spaced relation, and an interposed stratum of metal deposited intermediate the vane and the sides of the recess by which the vane is anchored in the annulus.

9. A rotary pump unit, including a rotor member having a radial recess extending through its periphery and defined by a bottom wall and spaced side walls, a vane member having a part of less width than that of the recess received in the latter, the side walls of the recess and the sides of said part of the vane member being zig-zag in shape with the high points of the hills of one member substantially in register with the dales of the other member, and a stratum of metal interposed in the space between the members, said hills and dales having their sides of a length to cause the metal stratum to be subjected to compression both laaterally and longitudinally of the insert member.

10. A rotary pump member, including an annulus having a radial recess in its periphery defined by bottom and relatively spaced corrugated side walls, a vane of less thickness than the width of the recess including a corrugated end which is received in relatively spaced relation in the recess, with the vane extending radially beyond the annulus in an axial plane thereof, the corrugations upon the adjacent faces of the inserted portion of the vane and the interior faces of the recess being disposed in alternate relation wherein the projections of one member are substantially opposite the indentations of the other member, and a stratum of metal interposed in the space between the corrugated faces of the vane and annulus recess, said corrugations being spaced and proportioned to subject the interposed metal stratum to compression incident to either lateral or longitudinal strain upon the insert vane.

11. The herein described method of forming a rotary pump member by affixing a radial vane to an annulus, including providing a radial recess with serrated faces in the periphery of the annulus of greater size than the portion of the vane to be joined thereto, inserting a vane having a serrated portion within the recess, fixedly clamping the annulus and vane in adjusted relation with the vane lying in an axial plane of the annulus and with its serrated inserted portion in spaced relation with the serrated sides of the recess, and forcing molten metal under pressure within the intervening space between the serrated inserted end of the vane and the serrated faces of the recess.

12. The herein described method of forming a rotary pump member by affixing an annulus and a radial vane one to the other, including providing an undercut radial recess in the periphery of the annulus, undercutting a terminal portion of the vane to be inserted in the recess, inserting the undercut portion of the vane in relatively spaced relation with the undercut portion of the recess, and with the plane of the vane projecting radially from the annulus substantially coincident with a radial plane of the annulus, fixedly holding the annulus and vane in their relatively adjusted relation, and filling the intervening spaces between the vane and interior faces of the recess with molten metal.

CARL W. ALBERTSON.