Oct. 17, 1944. R. C. ZEIDLER 2,360,383

METHOD OF ASSEMBLING FLUID COUPLING

Filed April 19, 1941

Fig. 1

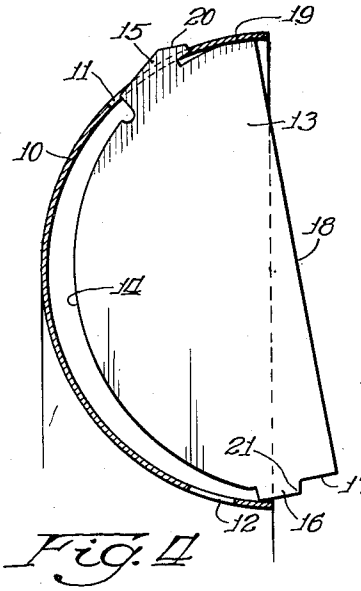


Fig. 2

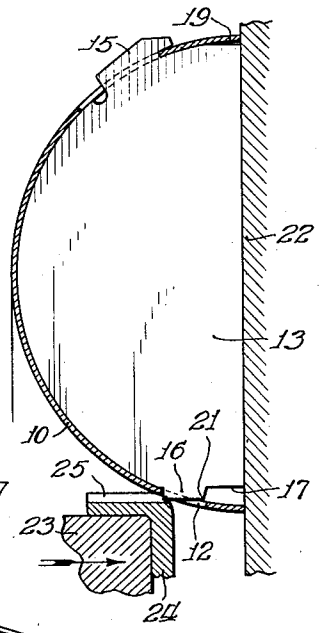


Fig. 3

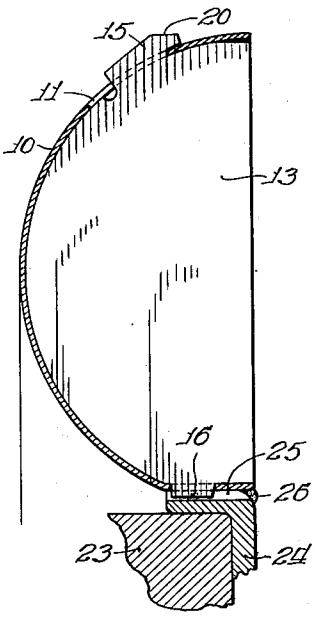


Fig. 4

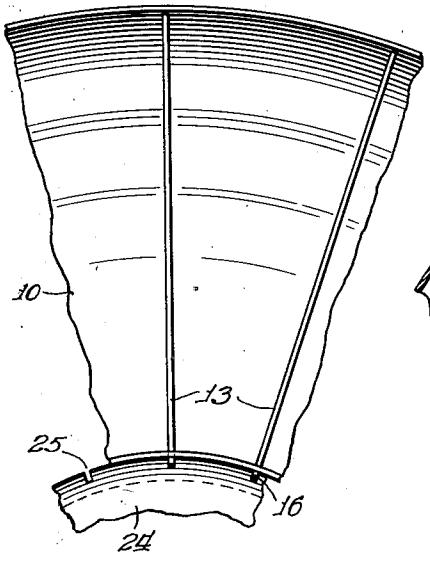


Fig. 5

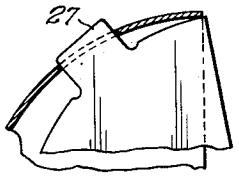


Fig. 6

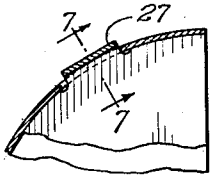
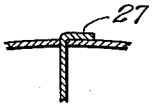


Fig. 7



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METHOD OF ASSEMBLING FLUID COUPLINGS

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Application April 19, 1941, Serial No. 389,285

7 Claims. (Cl. 29—156.8)

This invention relates to hydraulic couplings of the vaned type and to a method of fabricating such couplings.

The principal object of this invention is to provide a fluid coupling element which possesses the necessary strength to withstand the forces to which it will be subjected, and which nevertheless will be very inexpensive to fabricate.

Another object of this invention is to provide a method of fabricating hydraulic coupling elements, which method will require a minimum of special equipment.

These and other objects and features of the invention will become apparent from the following description when taken together with the accompanying drawing, in which:

Fig. 1 is a fragmentary section of a fluid coupling element showing a vane about to be inserted into a shell;

Fig. 2 shows the vane in place and about to be locked mechanically to the shell;

Fig. 3 shows the vane locked in place in the shell, and a drive-transmitting hub secured to the shell;

Fig. 4 is a fragmentary front elevation of an assembled vane element;

Fig. 5 is a fragmentary elevation in section showing a modification of the vane which may be used with the method shown in Figs. 1 to 3;

Fig. 6 shows the vane of Fig. 5 in place; and

Fig. 7 is a fragmentary section taken through line 7—7 of Fig. 6 showing how the vane of Fig. 5 is locked in place.

In its preferred embodiment, the method comprises forming a shell in the shape of a semi-toroid, forming a vane which departs from the shape of the torus over at least a portion of its periphery, forming a tab or extension in the non-conforming portion of the vane, and finally deforming the shell over the non-conforming region to make it conform to the outline of the vane, the act of deforming the shell resulting in a mechanical lock between the shell and tab which prevents the vane from being withdrawn.

Referring now to the drawing, 10 is a shell which may be in the form of a semi-toroid as shown in Fig. 1. It is preferably made from sheet metal, but it may also be made from any other sheet material, or it may also be made from cast material. The cross-section may be a semi-circle, or it may be of any desired contour. The shell is apertured at 11 and 12 as shown, the apertures being substantially in the same radial plane and being spaced from one another approximately as shown in Fig. 1. Thus, aperture 12 is located near the inner edge of shell 10 and aperture 11 is located approximately 30° away from the vertical axis, the point of reference being roughly the center of curvature of the shell 10.

A plurality of vanes 13 are stamped from sheet metal or other material into the form shown in Fig. 1. Edge 14 of vane 13 conforms to the shape of shell 10. A hook-shaped tab 15 is provided at the upper end of edge 14, and a substantially rectangular tab 16 is formed at the lower end of edge 14, said tab 16 being substantially parallel to and extending from a straight edge 17, which is at right angles to a second straight edge 18 extending across the open side of the vanes. Vane 13 is relieved at 19, and hook-shaped tab 15 is relieved at 20 as shown for the purpose hereinafter to be described.

To assemble vanes 13 into shell 10, each vane is tilted substantially as shown to insert tab 15 into aperture 11. The relief at 19 and 20 allows the hook to be inserted into its slot while tab 16 is slid into the shell. The vane is then rotated clockwise (Fig. 1) so that tab 15 hooks over the upper edge of aperture 11 and at the same time tab 16 will be moved to the left until edge 14 strikes shell 10. The shell and vane then appear as shown in Fig. 2.

Referring now to Fig. 2, it will be seen that edge 17 is at this stage spaced from shell 10, thereby providing considerable relief. It will also be apparent that the corner 21 of tab 16 just clears the inner edge of aperture 12. This means that the vane is not yet locked in place in the shell and could be worked loose despite the fact that tab 15 is hooked over shell 10. In order to lock the vane in place, therefore, shell 10 is deformed so as to bring it into contact with edge 17. Since a drive-transmitting hub must be secured to the element or semi-toroidal shell in any event, the deformation may be brought about by placing the assembled vanes and shell against a plate 22 and then by means of a suitable reciprocable punch 23 forcing a hub member 24 toward the plate, the hub member having an outside diameter which is just large enough to force the shell against edge 17. If desired the hub member may have axial grooves 25 broached in the outer surface thereof which receive tabs 16 as the hub member is forced toward plate 22.

The deformed shell is shown in Fig. 3. It will be observed that since tab 15 is hooked over shell 10, and the shell has been deformed, tab 16 is permanently locked in place and the vane therefore cannot work loose from shell 10. In order to prevent relative axial movement between the

shell and hub, the two may be welded together as shown at 26. It will be observed that a portion of the drive will be transmitted through tabs 16 as well as through the weld 26 and the latter, therefore, will be relieved of some of the torque.

It is understood that although hub 24 and edge 17 of vanes 13 have substantially parallel surfaces, that is, substantially concentric cylindrical surfaces, it is not necessary that this be the case. The surfaces may be somewhat conical if desired and may slope in either direction. The important feature resides in providing a certain amount of relief between the shell and vane in the vicinity of the tabs and then subsequently destroying the relief in order to lock the tabs to the shell. It is also to be understood that the tabs need not be located at the radially innermost region of the shell, but may be located off to one side, the shell being originally deformed and then pressed into semi-circular shape in order to destroy the relief between the vane and shell.

An alternative form of tab 15 is shown in Figs. 5, 6 and 7. In this form the tab comprises simply a rectangle 27 which, after the vane is in place, is bent over as shown in Figs. 6 and 7.

The assembled vanes, shell and hub member comprise an element of a completed coupling, it being understood that the element can be used either as a driving member or as a driven member and that the completed coupling would comprise two such elements in opposed relation to form a completed torus. It is understood further that the foregoing description is merely illustrative of the invention and that the scope of the invention, therefore, is not to be limited thereto but is to be determined by the appended claims.

I claim:

1. In a method of assembling a vaned element of a fluid coupling, the steps which comprise forming a semi-toroidal shell, providing pairs of radially spaced slots arranged circumferentially in the shell and spaced from the edges of the shell, forming vanes each having a pair of spaced tabs, said vanes each being such that it may fit inside the shell with its tabs extending through a pair of said slots and provide a relief between the shell and vane between the inner side edge of the shell and the adjacent tab, positioning the vanes to fit inside the shell with the tabs extending through the slots, and then forcing a hub member into the central region of the shell to thereby deform the shell and destroy the relief between each of the vanes and the shell and lock the tabs in the slots and the vanes in the shell.

2. In a method of assembling a vaned element of a fluid coupling, the steps which comprise forming a semi-toroidal shell providing pairs of radially spaced slots arranged circumferentially in the shell and spaced from the edges of the shell, forming vanes each having a first tab in the form of a hook and also a second tab spaced from the first tab, said vanes each being such that it may fit inside the shell with the first tab extending through and engaging the edge of one of a pair of slots which is adjacent the outer edge of the shell and the second tab extending through the other of the pair of slots adjacent the inner edge of the shell and the vane being such to provide a relief between the shell and vane between the second tab and the inner side edge of the shell, positioning each of the vanes to fit inside the shell by first inserting the first tab into its slot, and thereafter inserting the second tab into its slot and engaging the first tab with the edge of its slot, and then forcing a hub member into the central region of the shell to deform the shell and thereby destroy the relief between each of the vanes and the shell and lock the tabs in the slots and the vanes in the shell.

3. A fluid coupling element comprising a shell which is substantially semi-toroidal in shape and is open at one side, said shell having a substantially cylindrical region adjacent its inner edge and being provided with pairs of slots circumferentially arranged about the shell, one of the slots of each of said pairs being in said cylindrical region and the other of the slots being radially spaced therefrom and adjacent the other edge of the shell and each of the slots being spaced from the adjacent edge of the shell by a portion of the shell, and a plurality of vanes each having a pair of spaced tabs with one of the tabs being in the form of a hook, said vanes each fitting in said shell with its hook-like tab extending through and engaging the edge of one of a pair of slots which is adjacent the outer edge of the shell and the other of the tabs extending through the other one of the pair of slots whereby the vanes are held in the shell by the portions thereof between the slots and the edges of the shell.

4. In a method of assembling a vaned element of a power transmitting fluid coupling, the steps comprising: forming a semi-toroidal shell open at one side; providing a plurality of series of slots in said shell with each series including a pair of generally radial slots spaced from each other and with one slot of each pair adjacent to an edge of said shell; forming a plurality of vanes each having a pair of spaced tabs and with the respective vanes substantially semi-circular in shape so that each vane will fit in said shell with the tabs thereof extending through the slots of one of said pairs of slots, whereby the end of the slots nearest the edges of said shell can contact with the adjacent side edge of its associated tab to lock the vane in place, and with a portion of the inner surface of said shell between one of said slots and the adjacent edge of said shell in contact with a peripheral edge portion of said vane, and with the inner surface of said shell and another peripheral edge portion of said vane spaced to provide a relief in a zone between the other slot and the edge of said shell adjacent thereto; positioning said vanes to so fit in said shell; and bending said shell toward said vanes in the zone of said reliefs to substantially simultaneously bring said shell into engagement with all of said vanes, whereby to eliminate said reliefs so that said tabs and the portions of said shell between the respective slots and the adjacent edges of said shell then cooperate to hold said vanes from movement out of said shell.

5. In a method of assembling a vaned element of a power transmitting fluid coupling, the steps comprising: forming a semi-toroidal shell open at one side; providing a plurality of series of slots in said shell with each series including a pair of generally radial slots spaced from each other and with one slot of each pair adjacent to an edge of said shell; forming a plurality of vanes each having a pair of spaced tabs and with the respective vanes substantially semi-circular in shape so that each vane will fit in said shell with the tabs thereof extending through the slots of one of said pairs of slots, whereby the end of the slots nearest the edges of said shell can contact with the adjacent side edge of its associated tab to lock the vane in place, and with a portion of the

inner surface of said shell between one of said slots and the adjacent edge of said shell in contact with a peripheral edge portion of said vane, and with the inner surface of said shell and another peripheral edge portion of said vane spaced to provide a relief in a zone between the other slot and the edge of said shell adjacent thereto; positioning said vanes to so fit in said shell; and bending said shell toward said vanes in the zone of said reliefs to bring said shell into engagement with said vanes, whereby to eliminate said reliefs so that said tabs and the portions of said shell between the respective slots and the adjacent edges of said shell then cooperate to hold said vanes from movement out of said shell.

6. In a method of assembling a vaned element of a power transmitting fluid coupling, the steps comprising: forming a semi-toroidal shell open at one side; providing a plurality of series of slots in said shell with each series including a pair of generally radial slots spaced from each other and with one slot of each pair adjacent to an edge of said shell; forming a plurality of vanes each having a pair of spaced tabs one of which tabs is in the form of a hook and with the respective vanes substantially semi-circular in shape so that each vane will fit in said shell with the tabs thereof extending through the slots of one of said pairs of slots, whereby the end of the slots nearest the edges of said shell can contact with the adjacent side edge of its associated tab to lock the vane in place, and with a portion of the inner surface of said shell between one of said slots and the hook-tab and the adjacent side edge of said shell in contact with a peripheral edge portion of said vane, and with the inner surface of said shell and another peripheral edge portion of said vane spaced to provide a relief in a zone between the other slot and its associated tab and the edge of said shell adjacent thereto; positioning each of said vanes to so fit in said shell by inserting the hook-tab through one slot of a pair of slots and then rotating the vane to bring the other tab into alignment with the other slot of said pair; and bending said shell toward said vanes in the zone of said reliefs to substantially simultaneously bring said shell into engagement with all of said vanes, whereby to eliminate said reliefs so that said tabs and the portions of said shell between the respective slots and the adjacent edges of said shell then cooperate to hold said vanes from movement out of said shell.

7. In a method of assembling a vaned element of a power transmitting fluid coupling, the steps comprising: forming a semi-toroidal shell open at one side; providing a plurality of series of slots in said shell with each series including a pair of generally radial slots spaced from each other and with one slot of each pair adjacent to an edge of said shell; forming a plurality of vanes each having a pair of spaced tabs, one of which tabs is in the form of a hook, and with the respective vanes substantially semi-circular in shape so that each vane will fit in said shell with the tabs thereof extending through one of said pairs of slots, whereby the end of the slots nearest the edges of said shell can contact with the adjacent side edge of its associated tab to lock the vane in place, and with a portion of the inner surface of said shell between one of said slots and the hook-tab and the adjacent side edge of said shell in contact with a peripheral edge portion of said vane, and with the inner surface of said shell and another peripheral edge portion of said vane spaced to provide a relief in a zone between the other slot and its associated tab and the edge of said shell adjacent thereto; positioning each of said vanes to so fit in said shell by inserting the hook-tab through one slot of a pair of slots and then rotating the vane to bring the other tab into alignment with the other slot of said pair; and bending said shell toward said vanes in the zone of said reliefs to bring said shell into engagement with said vanes, whereby to eliminate said reliefs so that said tabs and the portions of said shell between the respective slots and the adjacent edges of said shell then cooperate to hold said vanes from movement out of said shell.

REINHOLD C. ZEIDLER.