Oct. 8, 1968 H. VIESSMANN 3,404,664

HOT WATER BOILER

Filed Oct. 17, 1967 3 Sheets-Sheet 1

Fig. 1

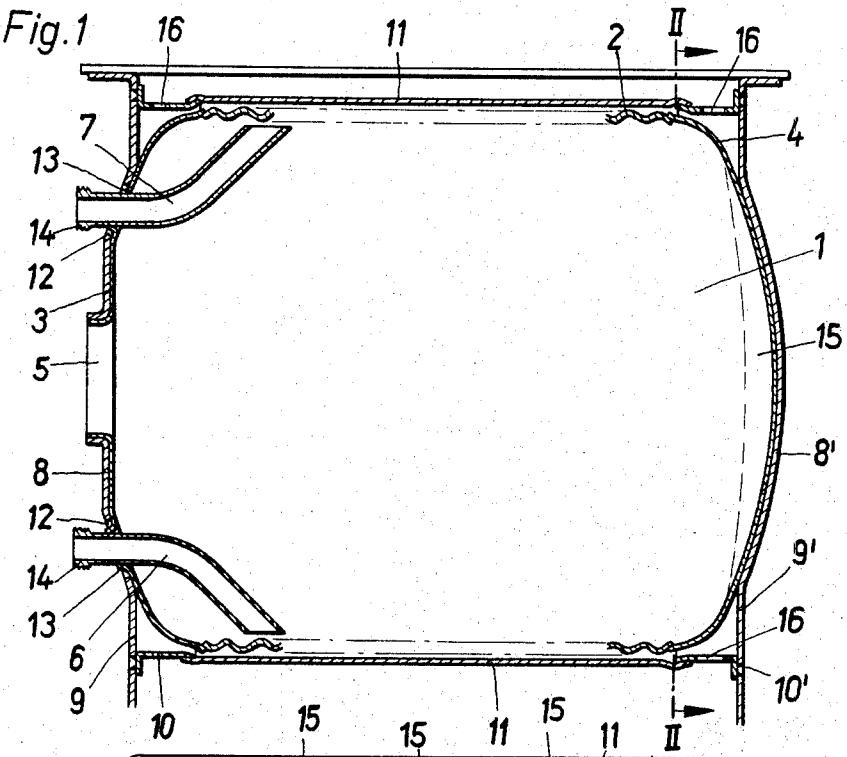

Fig. 2

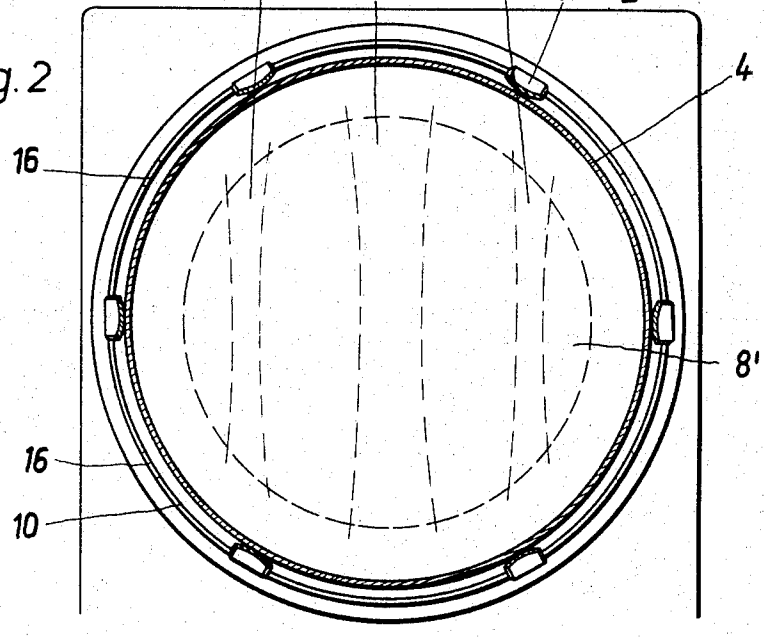

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Fig.3

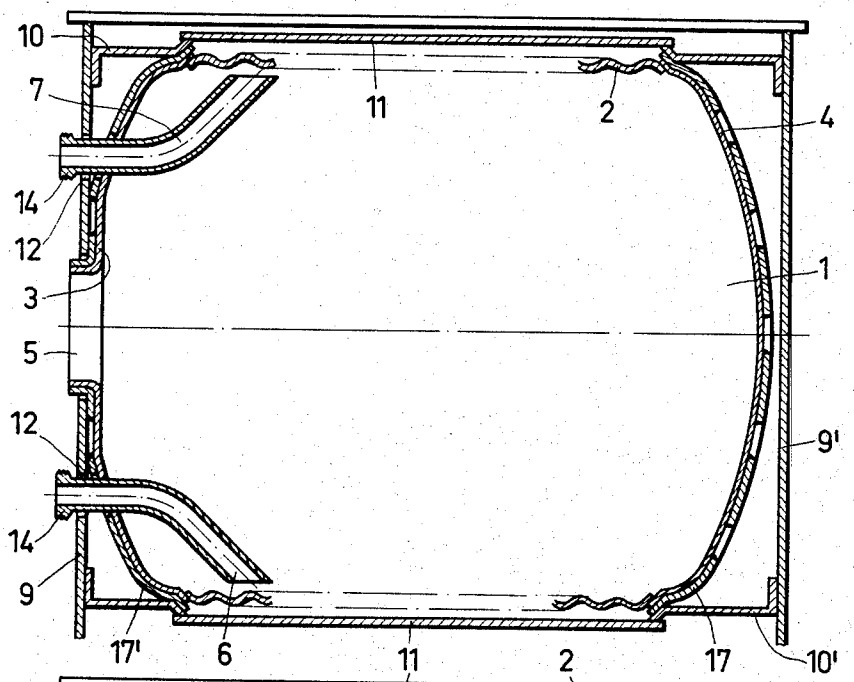
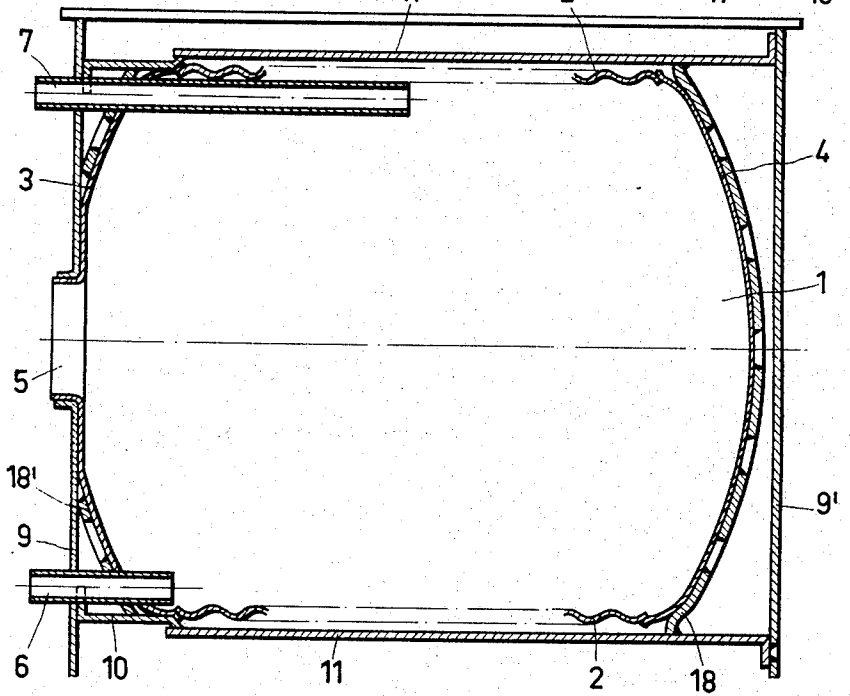


Fig.4



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HOT WATER BOILER

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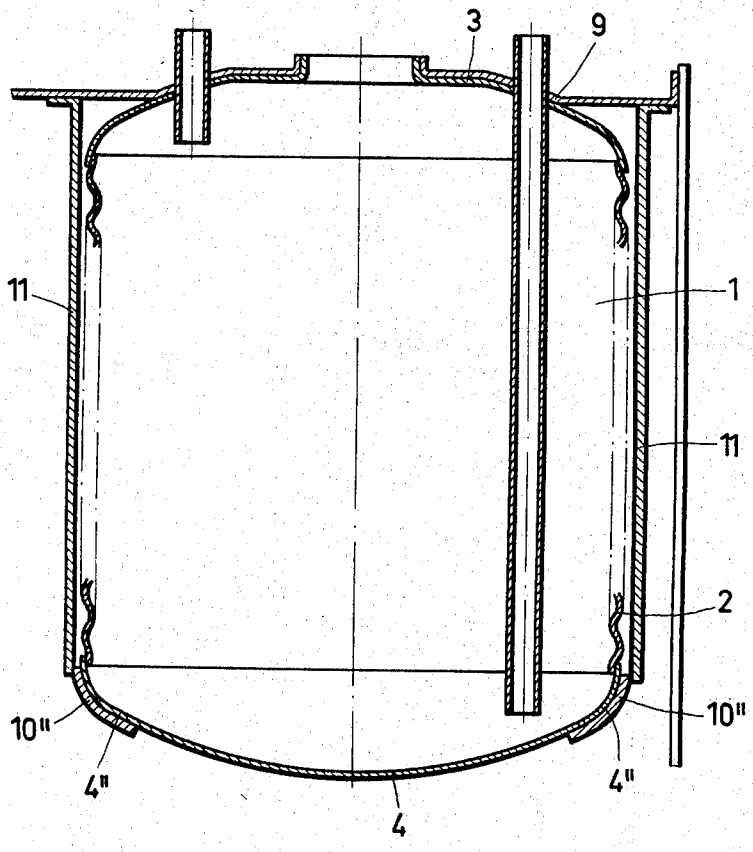

Fig.5

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3,404,664

HOT WATER BOILER

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Continuation-in-part of application Ser. No. 580,639, Sept. 20, 1966. This application Oct. 17, 1967, Ser. No. 683,065
Claims priority, application Germany, Sept. 30, 1965, V 29,430
17 Claims. (Cl. 122—32)

ABSTRACT OF THE DISCLOSURE

The water tank of a boiler is supported in the boiler shell by a supporting structure which includes longitudinal supporting bars disposed about and in contact with the periphery of the axially extending water tank wall portion, with at least one of the supporting bar ends being rigidly secured to an annular supporting element which, in turn, is rigidly secured to an adjacent end wall of the boiler shell while the other bar ends are rigidly secured to the other boiler shell end wall if only one annular supporting element is provided. The supporting structure also includes reinforcing members conformingly shaped and in contact with the water tank end walls.

Background and summary of the invention

This is a continuation-in-part of my copending application Ser. No. 580,639, filed Sept. 20, 1966, now abandoned.

The present invention relates to a boiler including a boiler shell and a relatively thin-walled water tank therein for producing and storing hot water, and more particularly to a supporting structure for the water tank within the boiler shell.

Water tanks are installed in the water bearing shell of boilers above the furnace or combustion chamber. Present-day boilers are designed for high peak output capacity but low continuous output as compared to instantaneous or nonstorage water heaters having a large permanent output but a low peak capacity.

Non-storage water heaters may be economically made from such materials as copper or nickel-bronze, which are corrosion-resistant, because such units require relatively little material for their construction. However, making hot water tanks designed for high peak output capacity of such materials is very costly because of the amount of material necessary to obtain tanks of sufficient wall thickness. On the other hand, such materials as unalloyed steel do not have sufficient corrosion resistance, particularly to the ever increasing corrosiveness of present-day water supplies.

To reduce costs, it has been proposed to use relatively thin-walled hot water tanks and provide special supporting and reinforcing means for the tank walls.

It is a principal object of the present invention to provide an improved reinforcing and supporting structure for relatively thin-walled hot water tanks in boilers, which is relatively inexpensive and easy to install to serve simultaneously as support and reinforcement for the tank.

It is another object of this invention to minimize the number of elements in the reinforcing and supporting structure by making use of adjacent boiler shell wall portions as part of the structure.

It is also an object of the invention to provide improved and simplified means for mounting the water inlet and outlet means in the boiler shell and the water tank.

The boiler wherewith the supporting structure of the present invention is used includes a boiler shell and a relatively thin-walled water tank for producing and storing hot water. The boiler shell has a first wall portion

and two end wall portions, and the water tank has a first wall portion and two end wall portions, the first wall portions of the boiler shell and water tank extending in the same axial direction. The water tank is disposed within the boiler shell and water inlet and outlet means pass through the boiler shell into and out of the water tank. The water tank supporting structure of this invention includes a plurality of rigidly secured longitudinal supporting bars in contact with the first wall portion of the water tank and extending in the axial direction thereof. The bars are disposed in spaced relationship about the periphery of the first wall portion of the tank. An annular supporting element is interposed between one end of the longitudinal supporting bars and an adjacent boiler shell end wall, and the supporting element is rigidly secured to the supporting bar and the adjacent shell end wall. A reinforcing member is conformingly shaped and in contact with one of the water tank end walls for supporting the same.

According to one embodiment of the invention, two such annular supporting elements are interposed between respective ends of the longitudinal supporting bars and the adjacent boiler shell end walls, each of the supporting elements being rigidly secured to the supporting bar ends and the adjacent boiler shell end walls.

In accordance with another embodiment, one of the longitudinal supporting bar ends is rigidly secured directly to an adjacent one of the boiler shell end walls.

In one embodiment of the invention, one or both of the boiler shell end walls have portions conformingly shaped and in contact with adjacent end wall portions of the water tank to form the reinforcing member. In another embodiment, perforated supporting plates serve as reinforcing members.

Supporting structures incorporating the above and other features of the present invention will impart to the water tank sufficient resistance to axial and radial pressures to make it possible to make the water tank walls relatively thin, thus reducing the amount of relatively expensive material used for the construction of the tank. Also, such supporting structures serve simultaneously to mount the tank in the boiler shell and to reinforce the tank walls.

As is known per se, resistance to internal and external pressures may be further increased by making the water tank wall corrugated so that the tank may expand in the axial direction to a limited extent. In this manner, scale deposits and other incrustations will be separated from the walls of the tank, thus providing a self-cleaning effect.

The expansion of the water tank in the axial direction is limited by the longitudinal supporting bars rigidly secured directly or indirectly to the end walls of the boiler shell. The shell of the boiler also has a certain elasticity in such an arrangement to make allowance for the partly considerable fluctuations in the internal pressure as water flows out and the pressure decreases.

In the embodiments wherein the end walls of the boiler shell form part of the supporting structure, manufacturing costs are further decreased and installation simplified so that a very economical boiler can be produced.

Brief description of drawing

The above and other objects, features and advantages of the present invention will become more apparent from the following detailed description of certain now preferred embodiments thereof, taken in conjunction with the accompanying drawing wherein

FIG. 1 is a longitudinal sectional view of one embodiment of a boiler according to this invention;

FIG. 2 is a transverse cross section along line II—II of FIG. 1;

FIG. 3 is a view similar to that of FIG. 1 of another embodiment of the invention;

FIG. 4 is also a view similar to that of FIG. 1 showing yet another embodiment; and

FIG. 5 illustrates a fourth embodiment in a similar view.

Detailed description

To obviate redundancy in the description, the same reference numerals designate like parts operating in a like manner in all figures of the drawing.

Referring first to FIGS. 1 and 2, the boiler is shown to comprise a water tank **1** for producing and storing warm or hot water for industrial use, for instance. The water tank has relatively thin walls of corrosion-resistant material, the walls including a first, corrugated cylindrical wall portion **2** and bottom or end wall portions **3, 4** respectively sealing the interior of the tank at its ends. End wall portion **3** defines a cleaning port **5** which may be sealed by suitable means (not shown). Water is fed to the tank by water supply tube **6** extending into the interior of the tank through a suitable aperture in wall portion **3** and is delivered therefrom by water outlet tube **7** similarly positioned in the tank wall portion **3**.

If such a water tank is made of relatively thin sheet metal, it will not be able to withstand the high operating pressures to which such a boiler tank is subjected. Therefore, the present invention provides a supporting structure reinforcing and supporting the tank.

In the embodiment of FIG. 1, this supporting structure includes wall portions **8** and **8'** of the end wall portions **9** and **9'** of the boiler shell, the shell wall portions **8, 8'** being shaped conformingly to the shape of contacting tank end wall portions **3, 4**. The conforming boiler shell wall portions reinforce the end walls of the tank. A first, cylindrical shell wall portion **19** surrounds the water tank and defines an annular jacket therewith.

The cylindrical wall portion **2** of the tank **1** is reinforced and supported by a plurality of supporting bars **11** disposed in spaced relationship about the periphery of wall portion **2** and in contact therewith. As shown in FIG. 2, the supporting bars **11** are preferably of concave shape with respect to the wall portion **2** so as to increase the rigidity of the bars while only a small surface portion of the bars is in contact with the periphery of the tank so that longitudinal movement thereof is obstructed as little as possible.

A pair of annular supporting elements **10, 10'** are mounted between the boiler shell walls **9, 9'** and the respective ends of the supporting bars **11**, being rigidly attached to the shell walls and the supporting bar ends. The water tank and its support structure are disposed inside the boiler shell, and the longitudinal supporting bars **11** extend parallel to the axis of the tank.

The incorporation of the boiler shell wall portions **8, 8'** into the supporting structure for the water tank has the advantage that it obviates the need for a separate supporting and/or reinforcing means, such as a conventional cover, for the end walls of the tank, in addition to simplifying the water inlet and outlet means connections to the tank.

More particularly, these connections are provided simply by providing registering apertures **12, 12** in the contacting tank end wall portion **3** and shell wall portion **9**, the apertures in wall portion **3** being flanged at **13** to fit into the registering apertures of wall portion **9**. Suitable threaded connections **14, 14** are provided on the water inlet and outlet tubes **6** and **7**, respectively, for connection to a water inlet source and a hot water outlet (not shown).

To insure sufficient water circulation also in those regions of tank **1** where the end walls **3, 4** are in contact with the boiler shell wall portions **8, 8'**, at least one of the tank end walls may have formed therein a plurality of channels **15** indicated in broken lines in FIGS. 1 and 2. Water circulation in the annular jacket between the boiler shell and the hot water tank may be further enhanced by providing ports **16** in supporting rings **10, 10'**.

In the embodiments of FIGS. 3 and 4, the boiler shell has no wall portions conforming to the shape of tank end wall portions **3, 4** and reinforcing the same to form part of the tank supporting structure. Rather, perforated supporting plates conforming in shape to the tank end wall portions and contacting the same are provided as part of the tank supporting structure. These supporting plates preferably are of steel sheet and may be welded to the tank end wall portions.

In the embodiment of FIG. 3, which in all respects not otherwise described is identical with that of FIG. 1, two perforated steel sheet plates **17, 17'** are rigidly secured to the tank end walls, the perforations in the supporting plates serving to prevent any substantial obstruction of heat transfer in the regions of the tank end wall portions.

The modification of FIG. 4 differs from the embodiment of FIG. 3 in that one of the ends of longitudinal supporting bars **11** is rigidly connected directly to the boiler shell end wall **9'**, only one supporting ring **10** being provided in the supporting structure of this embodiment. While the perforated supporting plate **18'** is rigidly attached to supporting ring **10**, the other perforated supporting plate **18** is rigidly connected to the supporting bars **11** so that the peripheral portion of the supporting plate **18** forms, in effect, one of the supporting rings for the tank end walls.

As shown in FIG. 5, the above-described principles of the supporting structure for water tanks in a boiler may also be applied to an upright boiler wherein the water tank and boiler shell axes extend vertically. In this embodiment, which differs from that of FIG. 1 only in those aspects presently described, one of the ends of supporting bars **11** are directly and rigidly attached to boiler shell wall portion **9**, thus dispensing with annular supporting element **10**. On the other hand, the other annular supporting element **10''** is shaped to conform to a contacting annular peripheral portion **4'** of water tank end wall portion **4** so as to support the bottom of the tank.

While the invention has been described in connection with certain now preferred embodiments, it will be clearly understood that many modifications and variations may occur to those skilled in the art, particularly after benefitting from the present teaching, without departing from the spirit and scope of this invention as defined in the appended claims.

What is claimed is:

1. In a boiler including a boiler shell and a relatively thin-walled water tank for producing and storing hot water, the boiler shell having a first wall portion and two end wall portions, and the water tank having a first wall portion and two end wall portions, the first wall portions of the boiler shell and water tank extending in the same axial direction, the water tank being disposed within the boiler shell, and water inlet and outlet means passing through the boiler shell into and out of the water tank, the improvement of a water tank supporting structure including

(1) a plurality of rigidly secured longitudinal supporting bars in contact with the first wall portion of the water tank and extending in said axial direction, said bars being disposed in spaced relationship about the periphery of the first wall portion of the water tank,

(2) annular supporting element interposed between one end of the longitudinal supporting bars and an adjacent one of the boiler shell end walls, the supporting element being rigidly secured to the supporting bar ends and the adjacent shell end wall,

(3) a reinforcing member conformingly shaped and in contact with one of the water tank end walls for supporting the same.

2. In the boiler of claim **1**, two of said annular sup-

porting elements interposed between respective ends of the longitudinal supporting bars and the adjacent boiler shell end walls, each of the supporting elements being rigidly secured to the supporting bar ends and the adjacent boiler shell end walls.

3. In the boiler of claim 1, the reinforcing member consisting of a conformingly shaped portion of the boiler shell end wall adjacent the water tank end wall.

4. In the boiler of claim 1, the reinforcing member consisting of a perforated supporting plate conformingly shaped and in contact with the adjacent water tank end wall.

5. In the boiler of claim 1, said axial direction being horizontal, the two end wall portions of the boiler shell being conformingly shaped and in contact with the two end wall portions of the water tank to constitute a pair of said reinforcing members.

6. In the boiler of claim 5, a pair of said annular supporting elements being interposed between the respective ends of the longitudinal supporting bars and the adjacent boiler shell end walls, the annular supporting elements being disposed about the periphery of the water tank end wall portions and being rigidly secured to the supporting bar ends and the adjacent shell end wall portions, respectively.

7. In the boiler of claim 1, said axial direction being horizontal, a pair of said reinforcing members conformingly shaped and in contact with adjacent ones of the water tank end wall portions, the reinforcing members consisting of perforated supporting plates.

8. In the boiler of claim 7, a pair of said annular supporting elements being interposed between the respective ends of the longitudinal supporting bars and the adjacent boiler shell end walls, the annular supporting elements being disposed about the periphery of the water tank end wall portions and being rigidly secured to the supporting bar ends and the adjacent shell end wall portions, respectively.

9. In the boiler of claim 8, wherein said reinforcing members are rigidly secured to said annular supporting elements.

10. In the boiler of claim 7, wherein one of said reinforcing members is rigidly secured to the annular supporting element and the other reinforcing member is rigidly secured to the longitudinal supporting bars, one of the ends of the bars being rigidly secured to the annular supporting element and the other end of the bars being rigidly secured to one of the boiler shell end wall portions adjacent thereto.

11. In the boiler of claim 1, the other end of the supporting bars being rigidly secured to an adjacent one of the boiler shell end walls.

12. In the boiler of claim 1, said axial direction being vertical, the upper one of the boiler shell end walls having a portion conformingly shaped and in contact with the upper one of the water tank end wall portions to form the reinforcing member for said upper water tank end wall portion, the upper ends of the longitudinal supporting bars being rigidly secured to the upper boiler shell end wall, and said annular supporting element being interposed between the lower ends of the longitudinal supporting bars and the lower boiler shell end wall, said annular supporting element being shaped to contact a peripheral portion of the lower water tank end wall portion so as to support the same.

13. In the boiler of claim 1, the longitudinal supporting bars being of concave shape in respect to the first wall portion of the water tank, the concavely shaped portion of the supporting bars being in contact with said first wall portion.

14. In the boiler of claim 1, the annular supporting element defining a port means for facilitating water circulation.

15. In the boiler of claim 1, at least one of the water tank end walls defining channels for enhancing water flow through the tank.

16. In the boiler of claim 1, wherein one of the boiler shell end wall portions and one of the water tank end wall portions are conformingly shaped and in contact with each other, the boiler shell end wall portion constituting said reinforcing member, and said boiler shell and water tank end wall portions define registering apertures wherein the water inlet and outlet means are mounted.

17. In the boiler of claim 1, said first wall portion of the water tank being corrugated in a direction transverse to the axial direction.

References Cited

UNITED STATES PATENTS

2,373,731	4/1945	Wilson et al.	122—32
2,739,576	3/1956	Ricardo	122—32 XR
3,028,843	4/1962	Carlson et al.	122—494 XR

KENNETH W. SPRAGUE, *Primary Examiner.*