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A. H. EL WAZIRI

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LOAD CELL WITH NESTING BEARING RINGS

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FIG. 1

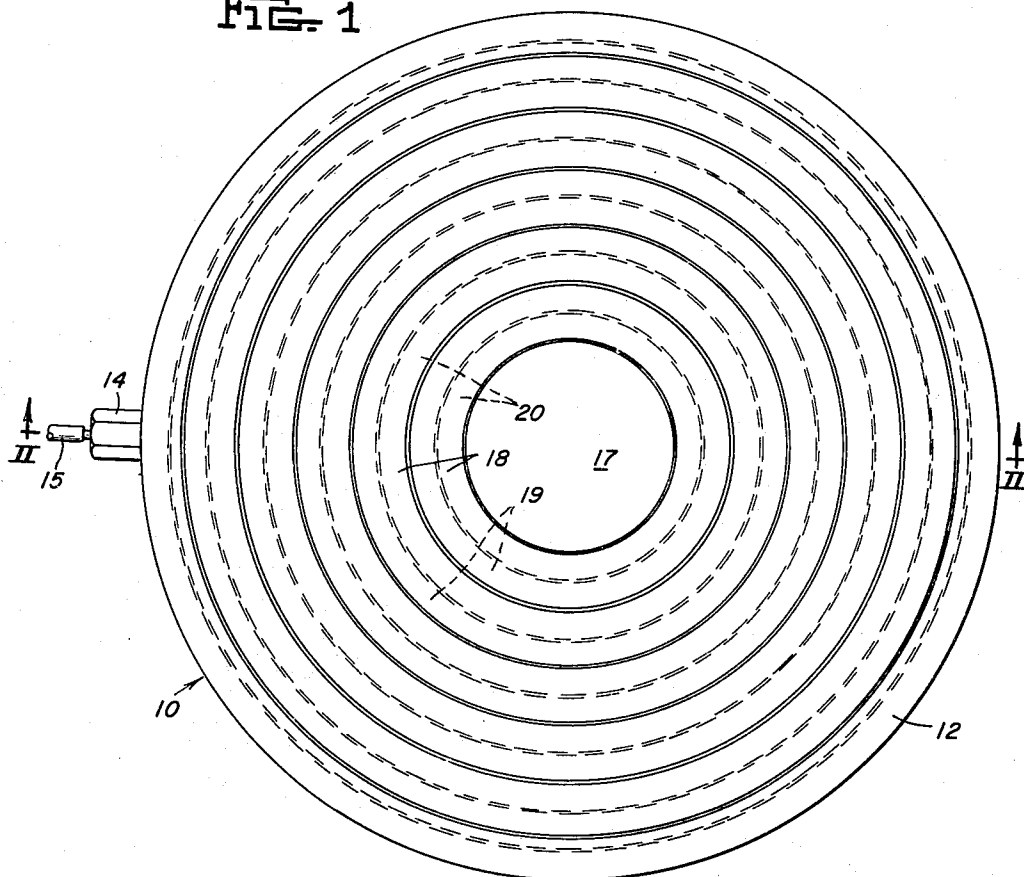
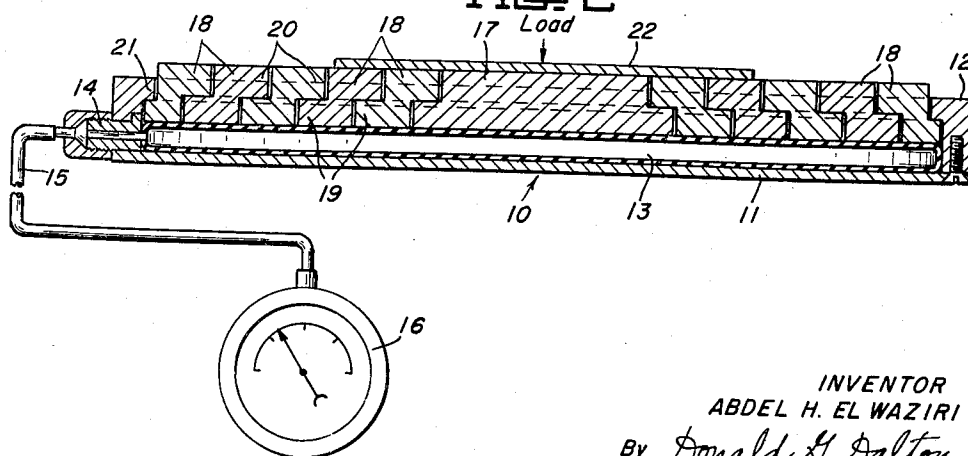


FIG. 2



INVENTOR
ABDEL H. EL WAZIRI
By *Donald G. Dalton*
Attorney

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Abdel H. El Waziri, Pittsburgh, Pa., assignor to United States Steel Corporation, a corporation of New Jersey
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This invention relates to an improved load cell which is simple and compact and has a wide range of capacity.

Load cells of known design are usually bulky and complex in construction and are limited to the measurement of loads in a relatively narrow range.

In its preferred form, my improved cell comprises a base plate having a collapsible pancake chamber thereon filled with a liquid which is but slightly compressible. A plurality of nesting concentric bearing members are disposed on the chamber and the latter is connected to a pressure gage. The pressure developed in the liquid by the application of a load measures the magnitude thereof. The number of said members used for supporting any given load governs the area of application and thus the range of the cell. The number of members acting in support of a load may be altered by changing intermediate range-selector plates of different sizes.

A complete understanding of the invention may be obtained from the following detailed description and explanation which refer to the accompanying drawings illustrating the present preferred embodiment. In the drawings:

FIGURE 1 is a plan view of my improved cell with the intermediate plate omitted; and

FIGURE 2 is a transverse section taken on the plane of line II-II of FIGURE 1.

Referring now in detail to the drawings, the cell 10 there shown comprises a circular base plate 11 having a peripheral ring wall 12 secured thereon. A collapsible pancake chamber 13 of rubber or the like fits snugly within wall 12 and communicates with a fitting 14 extending radially through it. A pipe connection 15 extends from fitting 14 to a gage 16.

Circular concentric nesting bearing members, including a central disc 17 and rings 18 therearound, rest on chamber 13. The disc and each ring have peripheral lower flanges 19 and the rings all have internal upper flanges 20. The disc and rings fit loosely together so that each is free to move except as confined by the flanges of the others. The outermost ring 18 is restricted from upward motion by means of an internal flange 21 which is an integral part of wall 12. Plate 11 is fastened to wall 12 by means of a number of set screws. Thus the wall 12 restricts the motion of ring 18 away from plate 11, the outermost ring 18 confines the next inner ring, and so on.

Disc 17 may be pressed against chamber 13 by an imposed load without any force being applied through any of the surrounding rings except that incident to their own weight. Similarly a load may be applied through the disc and any desired number of rings (less than all) without affecting those lying outwardly of the outermost ring under load. In this way the area of chamber 13 under load may be widely varied.

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Range-selector plates 22 of various sizes may be provided for applying loads to various areas of chamber 13. These plates are preferably slightly less in diameter than the plate 17 and rings 18. The plate 22 shown in the drawings as supporting the load (indicated by an arrow) on the cell, covers disc 17 and the two rings 18 adjacent thereto. The total area of the disc 17 and the two adjacent rings is the only area of chamber 13 to which external force is applied. This determines the unit pressure for a given load and the reading of gage 16.

Plate 22 may thus be considered as means for calibrating the gage to a desired range. The smaller the area of chamber 13 under external force, the smaller the load required to produce a given unit pressure in the enclosed liquid. It will be evident that, in the example given, the two outermost rings 18, while they do not exert any pressure on chamber 13, serve to restrain expansion thereof so that the force applied by the load is sustained by an increase in the pressure of the liquid. For the same reason, pipe 15 should be relatively inexpandable under the pressures involved, e.g., it should be of high-strength steel.

For load measurement, a first trial should be made with the largest-diameter intermediate plate to ascertain the order of magnitude of the load. Thereafter the size of plate may be chosen which will give the highest reading and greatest sensitivity for the load under measurement. If the pressure obtained is insufficient (less than substantially full-scale deflection of gage 16), smaller plates may be substituted until a suitable pressure is obtained. This procedure is reversed if the pressure obtained is too great. Pressure-load calibration curves may, of course, be supplied with each cell for the various loading discs.

It will be evident that my improved cell is characterized by a very wide range of capacity, and that any desired range may be easily selected. The cell is also compact and extremely simple in structure so as to require little maintenance and have a long useful life.

Although I have disclosed herein the preferred embodiment of my invention, I intend to cover as well any change or modification therein which may be made without departing from the spirit and scope of the invention.

I claim:

1. A load cell comprising a base plate, a collapsible pancake chamber laid flatwise on said plate adapted to contain a charge of liquid, a plurality of circular concentric nesting bearing members resting on said chamber and means for indicating the pressure developed in said liquid by a load applied to certain of said members.

2. The combination defined in claim 1, characterized by said members including a central plate and a plurality of rings nestable thereon.

3. The combination defined in claim 2, characterized by said plate and rings having periphery flanges whereby each ring is supported on the member within it.

4. The combination defined in claim 1, characterized by a ring surrounding the outermost member and confining it to said plate.

No references cited.