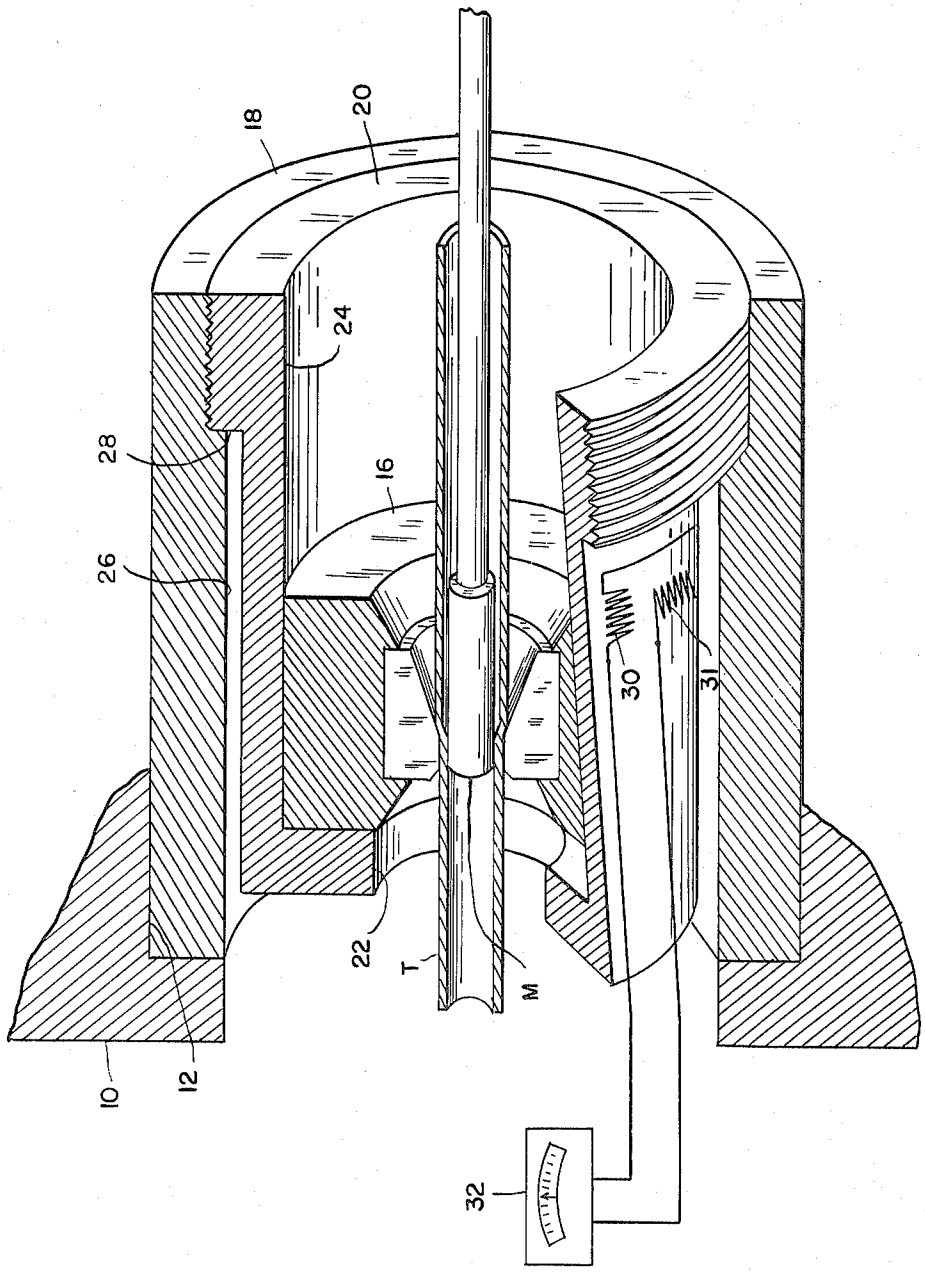
March 15, 1966 F. C. EDDENS 3,240,055

DRAWBENCH LOAD CELL

Filed Sept. 16, 1963



INVENTOR.
FLETCHER C. EDDENS
BY
Willmore Hulbert & Belknap
ATTORNEYS

United States Patent Office 3,240,055 Patented Mar. 15, 1966

3,240,055

DRAWBENCH LOAD CELL

Fletcher C. Eddens, Plymouth, Mich., assignor to Calumet & Hecla, Inc., Allen Park, Mich., a corporation of Michigan

Filed Sept. 16, 1963, Ser. No. 309,252
6 Claims. (Cl. 73—95)

The present invention relates to a drawbench load cell, and more particularly to a device capable of insertion in conventional drawbench equipment designed to provide instantaneous accurate indication as to load imposed on the die by the material being drawn.

It is an object of the present invention to provide a drawbench load cell including a strain gauge for measuring the stress imposed on the die.

More specifically, it is an object of the present invention to provide a drawbench load cell including a die supporting element subjected to tension by loads imposed on the die, and a strain gauge associated with the die on the element.

It is a further object of the present invention to provide a drawbench load cell including a tubular die supporting element subjected to axially applied tension as a consequence of the draw operation, and a plurality of strain gauges connected around said element so as to eliminate errors attributable to bending moments applied to the support element, as contrasted with axially applied stress.

Other objects and features of the invention will become apparent as the description proceeds, especially when taken in conjunction with the accompanying drawings, illustrating a preferred embodiment of the invention, wherein:

The figure is a fragmentary sectional view through the drawbench load cell and supporting mechanism.

The present invention is intended to be used in conjunction with a conventional drawbench including a die stand 10 and conventional dies. The die stand 10 includes die support structure having a plurality of die support sockets 12 adapted to receive dies dimensioned to fit snugly therewithin.

Ordinarily, the die support sockets or recesses 12 of the die stand are of cylindrical configuration including flanges 14 shaped to engage the end of a cylindrical die case and to support it against the stress applied by the draw operation. If it is desirable to use a smaller die case than that for which the die stand is designed, a cylindrical die adapter is normally employed having an outside diameter designed to fit within the recess 12 and having a cylindrical recess dimensioned to fit a smaller die case. For example, if the recess 12 is dimensioned to receive a four-inch diameter die case the die adapter would have a cylindrical recess of three inches in diameter and thus be adapted to receive and support a die having a three-inch case.

In the present case a load cell is provided adapted to fit within the recess 12 and to support a die 16 therein. The load cell comprises an outer tubular compression member 18 dimensioned to fit within the cylindrical recess 12 and to engage the flange 14 at its forward end. Received within the tubular compression member 18 is a tubular die support element 20 which in use is subjected to tension applied axially thereof.

As best seen in the figure, the die support element 20 includes an abutment flange 22 at its forward end adapted to engage the front end of the die 16 and it is provided with a recess or opening 24 shaped and dimensioned to receive the die 16 therein. The outside diameter of the die support element 20 is smaller than the inside diameter of the compression member 18 so as to leave a substantial annular clearance space 26 therebetween. At its rear

end the die support element 20 is provided with an externally threaded radially extending flange 28 threaded in a correspondingly shaped end portion of the compression member 18.

Mounted in the annular space 26 between the compression member 18 and the die support element 20 are a plurality of strain gauges 30. These strain gauges are of the usual form and are adapted to provide an indication of strain of the element to which they are applied as a result of elongation thereof. Conveniently, these strain gauges are in the form of wire and elongation thereof as a result of strain in the member to which they are applied operates to change the resistance thereof.

In order to eliminate errors which might otherwise be caused by bending moments applied to the die support element 20, a plurality of active strain gauges 30 and temperature compensating strain gauges 31 are applied to the outside surface of the die support element 20 at uniformly spaced intervals therearound, and these strain gauges are suitably electrically connected to give an indication of average elongation of the die support element 20. The strain gauges 30 are suitably connected to an indicator or recorder 32.

From the foregoing it will be apparent that the load cell constitutes an assembly capable of quick insertion in the manner of an adapter into the die receiving recess of a die stand and adapted to support the conventional die in the same manner as an adapter. At the same time the load cell includes the cylindrical tubular die support element subjected to tension as a result of forces applied to the die during the draw operation.

In operation the tube T is drawn through the die 16, its outside diameter is reduced, and as illustrated herein, its inside diameter is determined by the mandrel rod M. Elongation or strain in the die support element 20 provides a direct indication on the indicator or recorder 32.

The drawing and the foregoing specification constitute a description of the improved drawbench load cell in such full, clear, concise and exact terms as to enable any person skilled in the art to practice the invention, the scope of which is indicated by the appended claims.

What I claim as my invention is:

1. A load cell for use in conjunction with a die stand having an opening therein shouldered at its forward end to provide abutment means for the reception of a correspondingly shaped and dimensioned die case, comprising a tubular compression member dimensioned to fit within the die opening, a tubular die support element within the tubular compression member, means connecting adjacent end portions at the rear of said compression member and die support element together with an annular clearance space therebetween forwardly of the connected rear end portions thereof, a shoulder at the forward end of the die support element engageable with the forward face of a die, and strain gauge means for measuring elongation of said die support element due to tensile stress applied thereto during the draw operation, said strain gauge means being attached to the outer surface of said die support element within the annular clearance space between said compression member and said die support element.

2. A load cell as defined in claim 1 in which the means for measuring elongation of the die support element comprises a plurality of strain gauges attached to its outer surface at uniform circumferential spacing.

3. In combination, a die stand having a die support recess provided with an inwardly extending abutment flange at its forward end, a load cell in said recess comprising an outer compression member engageable at its forward end with said flange and having an opening therein, a die support element received within the opening in

said compression member, means adjacent the rear ends of said compression member and die support element connecting said die support element to said compression member, said die support element having a die receiving opening therein and an abutment flange at its forward end, a die in said die support element having its forward end in engagement with the flange at the forward end of said die support element, and means for measuring elongation of said die support element as a result of tensile stress applied thereto by a draw operation.

4. The combination as defined in claim 3 in which said die support element is dimensioned to provide an annular space between it and the inner surface of said compression member, and in which the means for measuring elongation of the die support element comprises a strain gauge applied to the outer surface thereof within said space.

5. The combination as defined in claim 3 in which said die support element is dimensioned to provide an annular space between it and the inner surface of said compression member, and in which the means for measuring elongation of the die support element comprises a plurality of strain gauges applied at uniform circumferential spacing to the outer surface thereof.

6. A load cell for use in conjunction with a die stand having an opening therein shouldered at its forward end to provide abutment means for the reception of a correspondingly shaped and dimensioned die case, comprising a tubular compression member dimensioned to fit within the die opening with its forward end in abutment with the shoulder at the forward end of the opening in the die stand, a tubular die support element within the tubular compression member, means connecting adjacent end portions at the rear of said compression member and die support element together comprising an annular substantially radial abutment surface on said compression member and a radially outward extending annular projection on said die support element, a shoulder at the forward end of the die support element engageable with the forward face of a die, and strain gauge means for measuring elongation of said die support element due to tensile stress applied thereto during the draw operation, said strain gauge means being attached to said die support element.

References Cited by the Examiner

UNITED STATES PATENTS

1,896,674	2/1933	Longwell	205—25
2,775,118	12/1956	Legge, et al.	73—88.5
2,814,946	12/1957	Harris	73—141

RICHARD C. QUEISSER, *Primary Examiner.*

DAVID SCHONBERG, *Examiner.*