

1

2,835,128

ANCHOR DEVICE PULL GAUGE

Rudolph E. Herrstrum, Rockford, Ill., assignor to Greenlee Bros. & Co., a corporation of Illinois

Application December 14, 1955, Serial No. 553,059

11 Claims. (Cl. 73-141)

This invention relates to a testing gauge and, more particularly, to a pull gauge for anchor bolts, nuts, and the like devices.

With anchor bolts, nuts and the like which are secured at one end in some anchoring material, it is often desirable to ascertain the pull sustainable by such bolts and nuts before using them for anchoring purposes.

The general object of this invention is to provide a new and improved anchor device pull gauge.

Another object of this invention is to provide such a gauge which is small enough so that it can readily be held in the hands and used in relatively close quarters, and which is simple to operate and relatively economical to produce.

Another object of this invention is to provide such a pull gauge which includes a cylinder and piston device, of which one part is a pulling member and the other part is a pushing member, means for gripping an anchor bolt or the like device on the pulling member, means engageable with the anchoring material on the pushing member, means for causing relative movement between the two members to exert a pulling force on the anchor device, and gauge means for indicating the pull on the anchor device.

A further object of this invention is to provide such a pull gauge wherein the pushing member is a larger cylinder and the pulling member is the piston therein, the piston having a much smaller cylinder formed therein, a fluid passage between the smaller cylinder and the larger cylinder, and a plunger movable into the smaller cylinder and operable to pump fluid into the larger cylinder and exert a force against the pulling member.

A more detailed object of the invention is to provide such a pull gauge wherein the plunger is hollow and threadably mounted in the smaller cylinder for movement in and out of the smaller cylinder, by a rotary motion, the outer end of the plunger carrying the pressure gauge, a guard member is secured to the end of the plunger and adapted to act as a manual operating means for turning the plunger in and out of the smaller cylinder and a pressure relief valve is provided to prevent the pulling force from exceeding a predetermined value.

Other objects and advantages will become apparent from the following detailed description taken in connection with the accompanying drawings, in which:

Fig. 1 is a sectional view taken generally through the axis of an embodiment of the invention;

Fig. 2 is an enlarged sectional view of the pressure relief valve provided in the embodiment of Fig. 1;

Fig. 3 is a left end elevational view taken generally along line 2-2 of Fig. 1; and

Fig. 4 is a right end elevational view of the embodiment shown in Fig. 1.

While the invention herein described is a preferred embodiment, it is not intended to limit the invention to the specific form and arrangement shown, it being

2

contemplated that various changes may be made by those skilled in the art without departing from the spirit and scope of the appended claims.

In Fig. 1 an anchor bolt 4 is shown embedded in a mass of anchoring material 5, such as concrete, and has a threaded portion 6 extending externally of the material 5. The gauge disclosed herein is adapted to test or determine the pull sustainable by the anchor bolt 4 and includes a first and relatively large cylinder and piston device, of which one part acts as a pushing member and the other part acts as a pulling member, means on the pulling member for gripping the threaded portion 6 of the anchor bolt 4, means on the pushing member engageable with the anchoring material 5, a second cylinder and piston device of much smaller diameter, one part of which is formed on the pulling member and the other part of which is movably mounted thereon, relative movement of the two parts of the second cylinder and piston device causing a much smaller relative movement of the first cylinder and piston device to exert an amplified pull on the anchor bolt 4, and gauge means for indicating the pull on the bolt 4.

In the embodiment shown in the drawings, a cylinder member 7 is provided as the pushing member and has an annular flat end surface 8 engageable with the anchoring material 5, a first bore portion 9 and an enlarged bore portion or cylinder 10. The enlarged bore end of the cylindrical member 7 has an end cap 11 secured thereto, a portion 12 being threaded into the enlarged bore portion 10.

A piston member 13, movably mounted in the cylinder member 7, is provided as the pulling member. The piston member 13 has a first end or guide portion 14, slidably fitted in the first bore portion 9, a central enlarged portion 15 forming a piston slidably fitted in the cylinder 10, and a second end portion 16 extending outwardly from the cylinder member 7 and slidably fitted in a hole 17 formed in the end cap 11.

The second cylinder and piston device includes a cylinder 18 of much smaller diameter than cylinder 10 formed in the piston member 13 and extending to the end portion 16, and a piston or plunger 19 movably mounted therein to act as a pump for the purpose of varying the pressure of fluid in the cylinder 18. The cylinder 18 is closed at the other end by a threaded plug member 20 having a fluid passage therethrough which is normally closed by a pressure relief valve device 21 including a ball valve 22, mounted in a bushing 23 and controlling a port 24 in the bushing. A spring 22' bearing against a hollow gasket 23' threadably mounted in the bushing 23 normally urges the ball 22 into a position to close the port.

In the embodiment shown, the plunger 19 is rotatably mounted in the cylinder 18 by means of external threads 25 on the plunger 19 which are engageable with an internal threaded portion 26 of the cylinder 18. As shown in Fig. 1, the inner end of the plunger 19 has a reduced diameter, smooth, unthreaded portion 18' adapted to be received in the bore 18. The plunger 19 is hollow to form a passage 19' therein, and has its outer end operatively connected to a pressure gauge 27 threaded therein, as indicated at 28. Thus, by turning the plunger 19, the fluid pressure in the cylinders may be varied.

The cylinders and passages are preferably filled with a fluid such as oil. To transmit the pressure developed in the cylinder 18 to a working surface 29 of the piston member 13 which is disposed opposite the end 30 of the large cylinder 10, a passage is provided including a radial port 31 opening at one end to the cylinder 18 and at the other end to an annular recess formed by a

3

beveled edge 32 on the cylinder end 30. An annular groove 33 is formed in the working surface 29 of the piston 13 when the working surface 29 is disposed against the end 30.

Thus, when the fluid pressure in the cylinder 18 is increased as a result of movement of the plunger 19, the pressure is communicated to the working surface 29 of the piston member 13 to cause relative movement between the piston member 13 and the cylinder member 7. The flat end surface 8 of the cylinder member 7 is urged against the anchoring material 5 while the piston member 13 is urged away from the anchoring material 5. To exert this pressure on the anchor bolt 4 embedded in the anchoring material 5, a chuck means is secured to the end of the piston member 13. In the embodiment of the invention shown, the chuck means comprises an internally threaded nut member 34 adapted to be threadably secured on the threaded portion 6 of the anchor bolt 4. Member 34 may be provided with other anchor attaching means suitable for nuts or other device. The nut member 34 is fitted into a bore 35 formed in the end portion 14 of the piston member 13 and locked therein by a dowel pin 36. Thus, the movement of the piston member 13 away from the anchoring material 5 exerts a pull on the anchor bolt 4. To allow the flat end portion 8 of the cylinder member 7 to engage the anchoring material 5, the chuck means secured to the piston member 13 is disposed substantially within the bore portion 9 of the cylinder member 7.

To prevent leakage of the fluid from the cylinder member 7, an O-ring 37 is disposed between the first piston portion 14 and the first bore portion 9 and an O-ring 38 is disposed between the enlarged piston portion 15 and the enlarged bore portion 10. An O-ring 39 is disposed between the plunger 19 and the cylinder 18 to prevent leakage of fluid therefrom. A spring 40 having one end bearing against the end cap 11 and the other end bearing against the enlarged portion 15 of the piston member 13 serves to aid the return movement of the piston 13.

To prevent relative rotation between the cylinder member 7 and the piston member 13, an external slot 41 extending parallel to the axis of the piston member 13 is engaged by a dowel pin 42 press fitted in a lateral bore 43 formed in the end cap 11.

The pressure relief valve 21 is adapted to open at a predetermined pressure to relieve the pressure on the piston member 13 and prevent the pulling force from exceeding this predetermined value. The pressure relief valve 21 also acts to prevent damage to the pressure indicating gauge 27. The pressure indicating gauge is generally calibrated in pounds per square inch, the pressure relief valve being adapted to open at the maximum pressure indicatable by the gauge. In the embodiment of the invention shown, the working surface 29 of the piston portion 15 has an area of one square inch, the pressure gauge 27, thus, being calibrated to read directly in pounds pull. As shown in Fig. 4, the gauge 27 is calibrated to indicate a pull force up to 1,000 pounds, the pressure relief valve 21 being adapted to open at this value. As shown in Figs. 1 and 4, the pressure gauge 27 is externally protected by a cup shaped guard member 44 which substantially surrounds the gauge 27. The guard member 44 is threaded on the end of the plunger 19, as shown at 45, and is secured thereto by a set screw 46.

The guard member 44 also acts as a manual operating means for turning the plunger 19 into and out of the cylinder 18 and for this reason, the outer surface may be knurled to provide a good hand gripping surface for an operator. As an operator would normally hold the cylinder member 7 with the other hand, the outer surface of the cylinder member 7 may also be knurled.

The operation of this pull gauge is extremely simple, with the operator merely securing the chuck means on

4

the anchor device to be tested and then turning the plunger 19 into the cylinder 18. The power exerted by the operator is greatly amplified by the screw threads 25, 26 and the difference in the effective areas of the piston formed by the end 47 of the plunger 19 and the piston 15. The pressure gauge 27 may be calibrated to indicate the pressure being exerted on the anchor device being tested and may be used to determine whether a particular anchor device will maintain a predetermined pressure or the maximum pressure sustainable by a particular anchor device.

I claim:

1. An anchor device pull gauge comprising; a first cylinder and piston device of which one part is a pulling member and the other part is a pushing member, means on said pulling member for gripping an anchor device to be tested, means on said pushing member engageable with the anchoring material, a much smaller second cylinder and hollow piston device of which one part is formed on said pulling member and the other part is movably mounted thereon, movement of said other part of said smaller cylinder and piston device causing relative movement of said two parts of said first cylinder and piston device to exert a pull on the anchor device and a fluid pressure gauge mounted at the outer end of the hollow piston and in fluid communication with the smaller cylinder through the hollow piston for indicating the pull exerted on the anchor device.

2. An anchor device pull gauge as called for in claim 1 having a relief valve associated with said smaller cylinder and piston device and operable at a predetermined value to relieve the pull exerted on the anchor device by said first cylinder and piston device.

3. An anchor device pull gauge as called for in claim 1 wherein the parts of the smaller cylinder and piston device are screw threaded together to permit movement of one relatively to the other, and manually operable means on the smaller piston to effect such movement and acting as a guard for said gauge.

4. An anchor device pull gauge comprising; a cylinder member, a piston member movably mounted in said cylinder member, said piston member having a relatively smaller cylinder formed therein, means carried on one end of the piston member for gripping an anchor device, operating means for increasing and decreasing the fluid pressure in said smaller cylinder, passage means for conveying fluid pressure developed in the smaller cylinder to the piston member to urge the piston away from the anchor device, said cylinder member having a portion simultaneously urged against the anchoring material, and a fluid pressure gauge supported by one of said members and in fluid communication with said cylinders for indicating the pressure being exerted on the anchor device.

5. An anchor device pull gauge as called for in claim 4 having a pressure relief valve in said smaller cylinder adapted to open at a predetermined pressure value to relieve the pressure on said piston and prevent damage to said pressure gauge.

6. An anchor device pull gauge as called for in claim 4 wherein said operating means comprises a plunger threadably mounted in said smaller cylinder and a part on the end of the plunger for turning the plunger into and out of the smaller cylinder.

7. An anchor device pull gauge as called for in claim 6 wherein said plunger is hollow with the outer end thereof operatively connected to said pressure gauge.

8. An anchor device pull gauge comprising; a cylinder member, a piston member movably mounted therein and having means defining a relatively smaller cylinder, means secured to one end of the piston member for gripping an anchor device, means at the other end of the piston member for varying the fluid pressure in said smaller cylinder, a working surface on said piston member normally urged by resilient means against an end of said cylinder member, a fluid passage extending between said

5

smaller cylinder and said working surface so that when the fluid pressure therein is increased, the piston member is moved away from the anchor device and exerts a pull thereon and the cylinder member is simultaneously pressed against the anchoring material, and fluid pressure gauge means supported by one of said members and in fluid communication with said cylinders for indicating the pull exerted on the anchor device.

9. An anchor device pull gauge as called for in claim 8 having a pressure relief valve closing one end of said smaller cylinder comprising a fluid passage normally closed by a spring-urged ball, said relief valve adapted to be opened by a predetermined pressure to relieve the pull exerted on the anchor device by said piston member and to prevent damage to said gauge means.

10. An anchor device pull gauge comprising; a cylinder member having an end engageable with anchoring material surrounding an anchor device, a piston movably mounted in said cylinder member and having a face abutable against a shoulder formed in said cylinder, means carried on the piston and positioned adjacent and inside said cylinder end for gripping an anchor device, a much smaller cylinder formed in said piston at the end

6

thereof opposite said means, a radial port placing the smaller cylinder in fluid communication with said face of the first mentioned piston, a smaller piston movable in said smaller cylinder for varying the fluid pressure in said smaller cylinder and the fluid pressure against said piston face, and means responsive to said fluid pressure for indicating the pull on the anchor device.

11. An anchor device pull gauge as defined in claim 10 wherein said smaller piston is hollow, and said last means comprises a fluid pressure gauge mounted on said smaller piston in fluid communication with said cylinders through the hollow piston.

References Cited in the file of this patent

UNITED STATES PATENTS

1,353,600	McBride	Sept. 21, 1920
1,387,674	Wood	Aug. 16, 1921
2,477,854	Baker	Aug. 2, 1949
2,490,284	Simart	Dec. 6, 1949
2,504,393	Cook	Apr. 18, 1950
2,593,269	Clifford	Apr. 15, 1952
2,735,649	Swallert	Feb. 21, 1956