Feb. 17, 1970 R. R. B. BRUCE 3,495,330

TOOL

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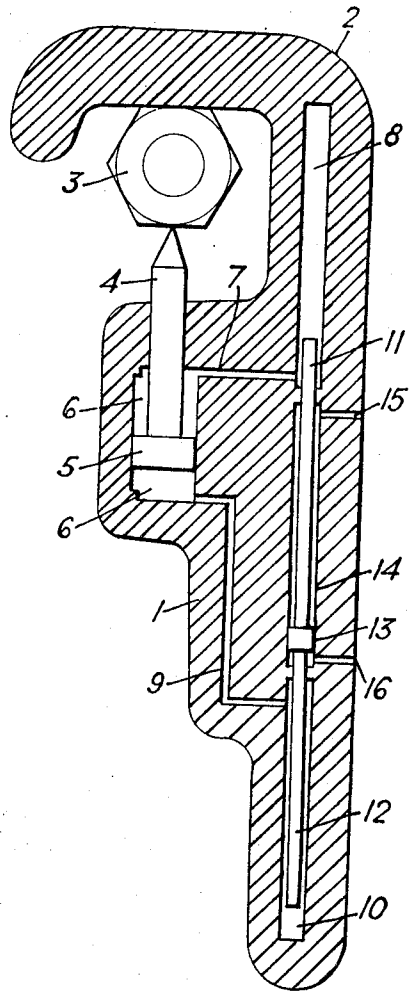


FIG. 1.

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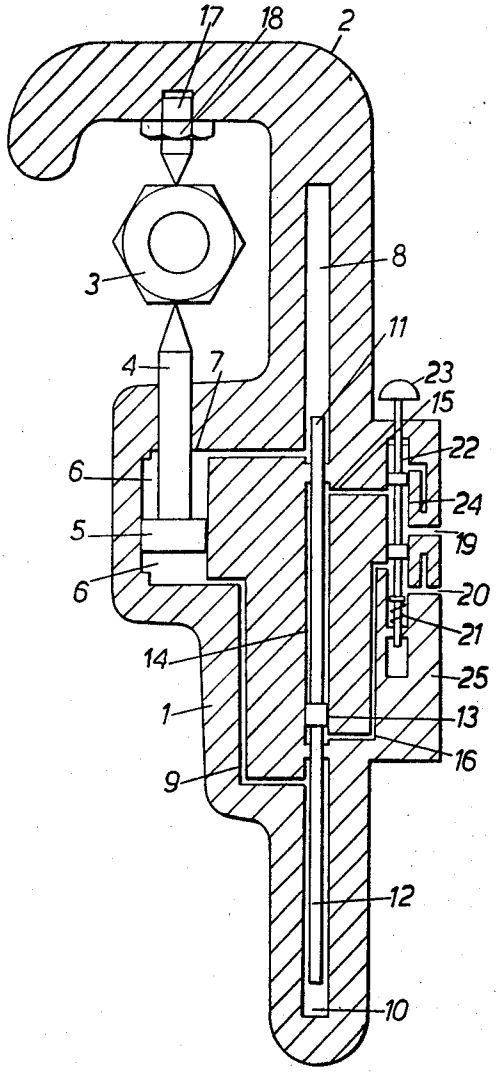
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Fig. 2.



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TOOL

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U.S. Cl. 30—180 6 Claims

ABSTRACT OF THE DISCLOSURE

A tool suitable for splitting nuts comprises a splitting member actuable by hydraulic pressure and means for applying gas pressure to the hydraulic fluid.

This invention relates to a tool suitable for splitting or fracturing hollow bodies such as nuts, washers, bushes, tubular spacing pieces and the like.

The disassembly of nuts and the like using conventional tools such as spanners is a laborious process often involving uneconomical use of man-power. In many situations, for example when large numbers of nuts have to be disassembled or when the nut or the like has become firmly fixed in its assembled position owing to for example, corrosion, it is more economical to fracture or split the nut or the like in situ and thereby release it from its assembled position.

According to the invention there is provided a tool suitable for splitting nuts or the like which comprises a movable splitting member provided at one end with a splitting edge, means for applying pressure through a hydraulic fluid to the other end of the splitting member, means for holding the splitting member against the nut or the like and means for applying gas pressure to the hydraulic fluid.

The splitting member may very suitably be a metal rod of circular cross-section. The splitting edge is preferably provided by a chisel which may be bevelled on one or both sides.

The splitting member is located in the tool in such a way that the end opposite to the splitting edge can be subjected to pressure exerted through a hydraulic fluid. It is preferred that the end of the splitting member opposite to the splitting edge is connected to a piston through which hydraulic pressure is exerted. It is also preferred that the piston is so arranged that hydraulic pressure may be applied to either side of the piston in order to cause movement of the splitting member in either direction along the longitudinal axis of the splitting member that is, towards or away from the nut or the like. However, retraction of the splitting member from the nut or the like may be effected by other means such as by a spring.

It is also preferred that means are provided for limiting the longitudinal movement of the splitting member so that the splitting edge does not come into contact with and thereby damage, the member on which the nut or the like is located.

The tool incorporates holding means for holding the splitting member against the nut or the like so as to react against the force applied through the splitting member, The holding means may be provided with a splitting edge suitably in the form of a chisel which acts on the nut or the like in the opposite sense to the movable splitting member.

Pressure is applied to the splitting member through a hydraulic fluid and the pressure may be transmitted through at least one duct or channel which may be connected to a source of hydraulic fluid separate from the

tool and to which gas pressure may be applied. It is however, preferred that the said duct or channel is connected to a chamber within the tool in which a slidable ram actuable by gas pressure is located. This slidable ram may be connected to a piston slidably located within a further chamber to which gas pressure may be applied. The gas pressure may be controlled by means of a valve located on the tool.

The gas pressure may be supplied very conveniently by compressed air from a compressor or a compressed air bottle. Other compressed gases such as nitrogen may however be used and the compressed gas may be generated as the result of the explosion of a small explosive charge.

In using the tool it is placed over the nut or the like so that the holding means is in contact with the nut or the like and the splitting member is in its retracted position. Gas pressure is then applied to the hydraulic fluid and the splitting member thus caused to press against and finally split the nut or the like.

In the following description the invention is illustrated by way of example only, with reference to the accompanying drawings in which:

FIGURE 1 is a sectional plan view of one embodiment of the tool of this invention; and

FIGURE 2 is a similar view of a slightly different embodiment.

Referring to the drawings the tool consists of a handle **1** having a head **2** adapted to partly encircle a nut **3**. A fixed splitting member or chisel **17** is attached by means of a nut **18** to the head **2**. A movable splitting member or chisel **4** is slidably located within the head in such a manner that when it is brought into contact with one face of the nut the latter is gripped between the fixed head and the movable chisels. The chisel **4** is attached to a piston **5** slidable in a hydraulic chamber **6** the upper part of which is connected through a duct **7** to a hydraulic ram chamber **8** and the lower part of which is connected through a duct **9** to a hydraulic ram chamber **10**. The rams **11** and **12** within chambers **8** and **10** respectively are joined to a common piston **13** slidably located within compressed air chamber **14** having ports **15** and **16** near opposite ends to permit the ingress or egress of compressed air to or from the cylinder. The ports **15** and **16** are connected to cylinder **24** of a valve **25**. The cylinder **24** is also connected to a source of compressed air via compressed air inlet port **20** and to the atmosphere via exhaust port **19**. A piston valve assembly **22** is slidably located in cylinder **24** so that if one of ports **15** and **16** is connected to exhaust port **19** the other port is connected to compressed air inlet port **20**. A finger button **23** is attached to one end of piston valve assembly **22** and a return spring **21** to the other end.

In use the tool is placed over the nut as shown in the drawings but with the chisel **4** in a retracted position. Then the finger button **23** is depressed to open port **16** to exhaust port **19** and to connect port **20** to port **15**, thus admitting compressed air into chamber **14** to force piston **13** down the chamber and ram **12** into hydraulic ram chamber **10**. Pressure is thereby applied to the hydraulic fluid in chamber **10** to cause the fluid to flow through duct **9** into the lower part of chamber **6** and there act on piston **5** to bring chisel **4** into contact with the nut. The movement of piston **13** simultaneously withdraws ram **11** from chamber **8** and allows hydraulic fluid to pass from the upper part of chamber **6** to chamber **8**. The compressed air pressure is maintained until the nut splits.

After splitting the nut the finger button is released thus allowing the piston valve assembly **22** to return to its original position by the action of return spring **21**. In this way port **15** is connected to exhaust port **19** while port **16** is connected to port **20** to admit compressed air into chamber **14** so as to force piston **13** up the chamber and

ram **11** into hydraulic ram chamber **8**. As a result hydraulic fluid is forced into the upper part of chamber **6** and there acts on piston **5** to retract chisel **4**.

In retracting the chisel the above described operations are reversed by connecting the source of compressed air to port **16** and opening port **15** to atmosphere.

I claim:

1. A tool suitable for splitting nuts which comprises in comprises in combination:

a movable splitting member provided at one end with a splitting edge,

a piston attached to the other end of the splitting member,

means for applying hydraulic pressure through hydraulic fluid to either side of said piston so as to reciprocate the movable splitting member towards and away from a nut which is to be split, said means for appling hydraulic pressure comprising ducts in communication with opposite sides of said piston and in communication with two chambers which are connected to the ducts, and including a slidable ram located to reciprocate alternately into said two chambers so as to displace hydraulic fluid from either of the two chambers, and further including valve-controlled means for applying gas pressure to the ram so as to control reciprocations of the ram,

means for applying gas pressure to the hydraulic fluid, and

holding means for holding the nut against said movable splitting member.

2. A tool as claimed in claim **1** in which the splitting edge is provided by a chisel.

3. A tool as claimed in claim **1** in which the means for applying gas pressure comprises a valve located on the tool to control the gas supply.

4. A tool as claimed in claim **1** in which means are provided for limiting longitudinal movement of the splitting member.

5. A tool as claimed in claim **1** in which the holding means is provided with a splitting edge.

6. The tool of claim **1** wherein said slidable ram is connected to a piston slidably fitted within a third chamber to which said gas pressure may be applied.

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30—228; 60—54.5