March 31, 1953 J. C. NISCHAN 2,633,197

DRAW PUNCH

Filed Jan. 12, 1950

FIG. 1.

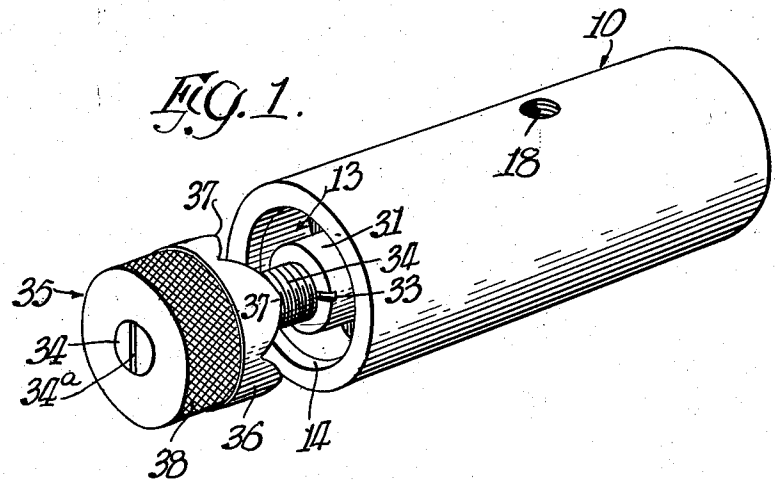


FIG. 2.

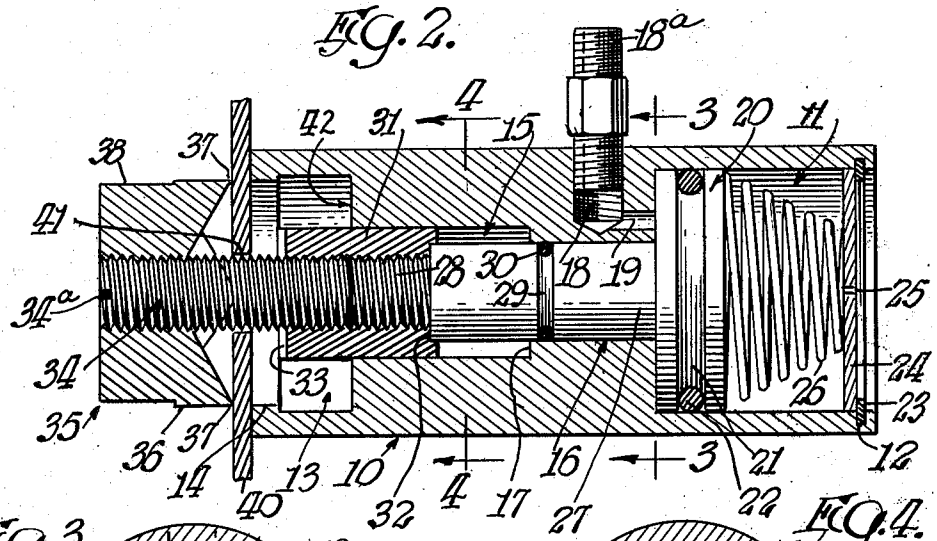


FIG. 3.

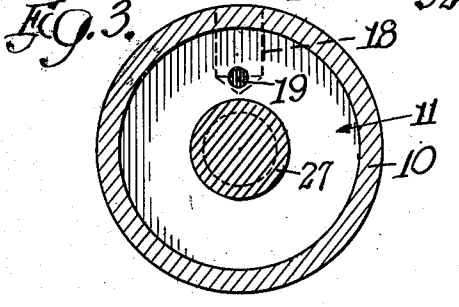
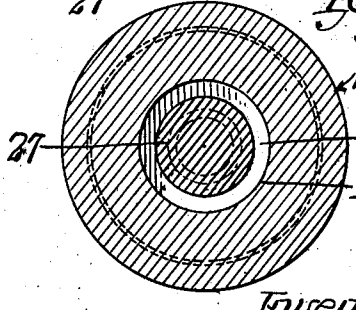


FIG. 4.



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DRAW PUNCH

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4 Claims. (Cl. 164—95)

1

This invention relates to improvements in draw punches and it consists of the matters hereinafter described and more particularly pointed out in the appended claims.

The invention is more especially concerned with draw punches of the kind that embody a die with which is associated a punch that is drawn into operative relation to the die by means of a bolt-like draw bar or shaft. Heretofore generally in such punches a nut-like element was threaded on the draw bar and had to be turned manually in one direction, with the aid of a wrench to provide the relative movement between the die and punch in a punching operation. Thus such a draw punch was slow in operation and required considerable effort on the part of the operator. After a punching operation the draw bar had to be turned manually in the other direction to return the parts to a position ready for the next punching operation. A draw punch of this general kind is illustrated in my now expired Patent No. 1,754,568. There have been some attempts to improve upon punches of this type by providing fluid operating means but such instructions have been open to a number of objections.

One of the objects of the present invention is to provide a draw punch of a simple construction, wherein the draw bar is actuated positively and quickly in a punching operation and is quickly returned to the position for the next operation, without requiring laborious work by the operator and which will overcome objections found in constructions heretofore available.

Another object of the invention is to provide a punch of this kind that includes a pressure fluid cylinder having as an integral part, at one end thereof, the die of the punch as a whole.

A further object of the invention is to provide a punch of this kind, which is small and light enough in weight so that it may be held in one hand, thus leaving the other hand free for operating the punch, which is capable of use in punching holes in metal considerably thicker than could be punched by manually operated draw punches, and which will be operable for long periods of time without the danger of breakage of parts of the device.

Also, it is an object of the invention to provide a draw punch of this kind wherein a connection is provided between the piston and the draw bar proper, which permits of a limited lateral motion therebetween, so that the forces tending to cant the piston and cause it to bind in its chamber, are taken up in said connection and whereby

2

the piston has a free straight line motion in its chamber so that scoring of the chamber is avoided and damage to the seals that are movable with the piston is prevented.

Again, it is a further object of the invention to provide in a punch of this kind, a simple and efficient arrangement of parts that relieves the piston of impact due to the sudden surge of pressure delivered thereagainst at the end of a punching operation so that the piston is not damaged or battered and therefore has a longer period of usefulness.

The above mentioned objects of the invention, as well as others, together with the advantages thereof will more fully appear as the specification proceeds.

In the drawing:

Fig. 1 is a perspective view of a draw punch embodying the preferred form of the invention.

Fig. 2 is a longitudinal vertical full size sectional view through one form of the improved draw punch.

Figs. 3 and 4 are transverse vertical sectional views through the punch, as taken on the lines 3—3 and 4—4 respectively and on the scale of Fig. 2.

Referring now in detail to that embodiment of the invention illustrated in the accompanying drawing, the improved punch includes a cylinder-like body 10 formed at its rear end with a chamber 11 and near the rear extremity of which is an internal groove 12 as appears in Fig. 2. The purpose of said groove will appear later. The body 10 is formed at its front end with a second chamber 13, the front end of which is somewhat restricted in diameter to form a die opening 14 at the front end of the cylinder, which defines the diameter of the opening made by the punch. In this instance the diameter of the chamber 13 approximates that of the chamber 11.

Extending rearwardly from and axially with the chamber 13 is a bore 15 and extending forwardly from the chamber 11 is a second bore 16. The bore 16 has a diameter less than that of the bore 15 and said bores join one another at a radial shoulder 17.

In the cylinder-like body about midway between the ends of the bore 16 is a radial port 18 for receiving one end of a coupling or fitting 18a, the other end of which is adapted to have attached thereto one end of a high pressure hose (not shown) leading from a means for supplying a fluid under pressure from a suitable pump (not shown) such as a hydraulic pump. The inner

end of said port 18 is connected to the chamber 11 by a longitudinally extending port or passageway 19.

A piston or plunger 20 is disposed in the chamber 11 and in the periphery of said piston is an annular groove 21 to receive a sealing member in the form of a rubber ring 22. The coacting surfaces of the piston and the chamber have a ground fit and in the movement of said piston in either direction, the ring 22 forms an effective seal so that hydraulic fluid cannot pass the piston to enter into the rear end of said chamber. The groove 12, before mentioned, receives a split spring ring 23 which affords a backing for an abutment disc 24 in which is a small vent opening 25. A spring 26 is disposed between the abutment disc 24 and the outer end of the piston and in the absence of pressure in the chamber 11 forwardly of the piston, said spring urges the piston forwardly to a position where the front face of the piston is engaged with the front end of the chamber 11.

The piston includes a forwardly extending stem 27 which has a ground fit in the bore 16, but has a length greater than that of said bore, which in itself has a length greater than the travel or movement of the piston 20 in the chamber 11. At the front end of said stem is a threaded extension 28 of a reduced diameter. In the periphery of said stem, about midway between its ends is an annular groove 29 that receives a sealing member 30 in the form of a rubber ring. This ring is so spaced from the piston that it does not pass either end of said bore 16 in the movement of the piston.

31 indicates a sleeve that has a ground sliding fit in the bore 15. It is internally threaded for engagement upon the stem extension 28 and it has an internal rear end shoulder 32 for engagement with a shoulder formed by the junction of the extension 28 with the body of the stem 27. This sleeve, which is about twice as long as the extension 28, is provided at the front end with cross grooves 33 for engagement by a spanner (not shown) for threading the sleeve upon said extension. When engaged on said extension, the front end of said sleeve is disposed forwardly of the extremity of said extension.

34 indicates an externally threaded shaft, the rear end of which is threaded into the front end of the sleeve 31 and the front end extremity of said shaft has a groove 34a therein to receive the blade of a screw driver (not shown) to turn said shaft into threaded engagement with the sleeve 31. 35 indicates the punch which is adapted for cooperation with the die 14 in a punching operation and this punch is formed internally for screw threaded engagement upon the front end of the shaft 34. It comprises a cylindrical body, the rear end 36 of which is of a diameter fitting the cutting surface of the die 14. This end of the punch is formed with cutting teeth each terminating in a point 37 and these teeth face the die. The other or front end 38 of the punch is slightly reduced in diameter and is knurled to provide a good finger grip thereon, whereby the punch may be conveniently applied to and removed from the shaft 24 by means of the fingers of one hand.

When no hydraulic pressure is present in the chamber 11, the spring 26 holds the piston against the front end wall of the chamber 11 and this disposes the front end of the shaft 34 some distance beyond the die 14 of the cylinder.

Assume that the punch is to be used in punching an opening in a piece of sheet metal 40, which opening will be one of the same diameter as the die and active part of the punch. A pilot hole 41 (see Fig. 2) is provided in the sheet metal 40 of a diameter permitting the passage of the shaft 34 therethrough.

The operator having removed the punch 35 by unscrewing the same from the shaft 34 inserts the front end of shaft 34 through the hole 41 from one face of the sheet metal so that said end of the shaft projects beyond the other face of the sheet metal. The punch 35 is then reapplied to the shaft and threaded thereon until the points 37 of the teeth engage said other face of the sheet metal.

Hydraulic fluid under pressure is admitted to the nipple 18a, which then passes through the port 19 into the front end of the chamber 11. Said pressure forces the piston 20 toward the disc 24, at the same time compressing the spring 26, the air in the chamber ahead of the piston being vented out through the port 25 in the disc 24.

This movement of the piston draws its stem 27, the sleeve 31 and the shaft 34 rearwardly of the cylinder, the points 37 of the punch thereby piercing and cutting through the sheet metal, in connection with the die. As the punch is drawn rearwardly the teeth cut in opposite directions on each side of each point with a shearing action, thereby cutting a disc from the sheet metal. This disc and a portion of the die move into the chamber 13.

Should one tooth of the die, in a punching operation, engage an area in the sheet metal which is harder than those areas engaged by other teeth, the resistance presented to said tooth is greater than that presented to the other teeth. This condition creates a tendency to cant or tip the punch laterally and if the punch were applied to an integral part of the stem, this canting action, though indeed slight, would be transmitted to the piston 20 and cause it to bind in its chamber with a possible scoring thereof, which would permit fluid to pass the piston with a resulting loss of power.

However, because of the use of the sleeve 31, the canting action, before mentioned, is taken up in the connection the sleeve affords between the shaft 34 and stem 27. Binding and scoring of the piston are avoided and pressure leaks are eliminated. Hence, the punch has a longer and better period of usefulness without requiring service. Also premature breakage of parts is eliminated.

It is pointed out that when the punch has just finished its cutting operation a surge of power is applied to the piston because the resistance offered to the punch in a cutting operation no longer obtains. This surge of power would ordinarily slam the piston up against the disc 24 with a possible damage to one or the other. However, by reason of the sleeve 31, its rear end will engage the shoulder 17 and prevent the slamming action of the piston under the conditions above mentioned. The engagement of sleeve 31 with shoulder 17 also prevents the points 37 of the punch teeth from hitting against the end wall 42 of die chamber 13 and thus prevents these points 37 from being bent or otherwise damaged. This will be apparent from viewing Fig. 2 of the drawing, wherein it is seen

that the distance between sleeve 31 and shoulder 17 is less than the distance between the teeth points 37 and wall 42.

When fluid pressure is shut off to the chamber 11, the spring 26 returns the parts to the position shown in Fig. 2, after which the punch 35 is unscrewed and removed from its shaft 24 and the cylinder-like body is moved away from the sheet metal 40. The disc cut therefrom and now lodged in the chamber 13 is removed and the punch is then ready for such other punching operations as may be desired.

While in describing the invention I have referred in detail to the form, construction and arrangement of the parts embodied in the punch, the same is to be considered only in the illustrative sense except as may be specifically set forth in the appended claims.

I claim as my invention:

1. A fluid pressure operated punch embodying therein means having a fluid pressure chamber in one end thereof and a second chamber at the other end and with a die portion at the extremity of said second chamber, there being bore portions of smaller and larger diameters in said means connecting said chambers and joining each other by a radial shoulder, a piston in said fluid pressure chamber, means for supplying fluid under pressure to said first mentioned chamber for moving said piston therein in the desired direction for a punching operation, a rod portion connected at one end to said piston and slidable in said bore portion of smaller diameter and at its other end extending into said bore portion of larger diameter, a second rod portion, a sleeve connecting one end of said second rod portion to the other end of the first mentioned rod portion and slidably engaged in said bore portion of larger diameter and adapted to engage said shoulder for limiting the movement of the piston in one direction, the other end of said second rod portion extending centrally through and beyond said die portion, and a punch removably and centrally engaged upon said other end of the second rod portion and cooperating with the die portion in the operation of the punch.

2. A fluid pressure operated punch embodying therein means having a fluid pressure chamber in one end thereof and formed with a second chamber at the other end and with a die portion at the extremity of said second chamber, there being bore portions of smaller and larger diameters in said means connecting said chambers and joining each other by a radial shoulder, a piston in said fluid pressure chamber, means for supplying fluid under pressure to said first mentioned chamber for moving said piston therein in the desired direction for a punching operation, a rod portion connected at one end to said piston and slidable in said bore portion of smaller diameter and at its other end extending into said bore portion of larger diameter where it terminates in an externally threaded extension of smaller diameter, an externally threaded shaft arranged axially of said rod portion with one end extending centrally through and beyond said die portions, an internally threaded sleeve slidably engaged in said larger diameter bore portion and having threaded connection with said threaded extension and with one end of said threaded shaft for joining them together in substantially end to end relation, said sleeve being adapted to engage said shoulder for limiting the movement of the piston in one direction, and a punch having a removable threaded engagement upon the other end of said shaft for cooperating with said die portion in the operation of the punch, said other end of said shaft engaging the punch centrally of the punch.

3. A fluid pressure operated punch embodying therein a cylindrical body member having a fluid pressure chamber in one end thereof and a second chamber at the other end thereof with a die portion at the extremity of said second chamber, a pair of consecutive cylindrical bore passages located co-axially of said body member, one of said passages having a larger diameter than the other passage and there being a radial shoulder located at the junction between said passages, a piston in said fluid pressure chamber, means for supplying fluid under pressure to said fluid pressure chamber to move said piston therein in the desired direction for a punching operation, a rod portion extending from said piston co-axially through the smaller diameter bore passage and into the larger diameter bore passage, said rod portion being slidably engaged in the smaller diameter bore passage, a second rod portion located co-axially of said body member, a cylindrical sleeve connecting one end of said second rod portion in substantially end to end relation to the end of the first mentioned rod portion which extends into the larger diameter bore portion whereby any canting of said second rod portion with respect to said first mentioned rod portion is taken up by said sleeve, said sleeve being slidably engaged in the larger diameter bore passage and being adapted to engage said radial shoulder for limiting movement of the piston in one direction, the other end of said second rod portion extending co-axially through and beyond said die portion, and a punch removably engaged upon said extending end of said second rod portion, said punch having a plurality of teeth thereon arranged concentrically with respect to said second rod portion and adapted to cooperate with said die portion in the operation of the punch.

4. A fluid pressure operated punch embodying therein means having a fluid pressure chamber in one end thereof and a second chamber at the other end thereof with a die portion at the extremity of said second chamber, said second chamber having an end wall spaced from said die portion, a pair of consecutive bore passages connecting said respective chambers, one of said bore passages being larger than the other one and said bore passages having a shoulder surface at the junction therebetween, a piston in said fluid pressure chamber, means for supplying fluid under pressure to said fluid pressure chamber to move said piston in the desired direction for a punching operation, a rod portion connected at one end to said piston and slidable in said smaller bore passage, said rod portion extending into said larger bore passage, a second rod portion, a sleeve connecting one end of said second rod portion to the end of said first mentioned rod portion which extends into said larger bore passage, said sleeve being slidably engaged in said larger bore passage and being adapted to engage the shoulder located at the junction between said bore passages for limiting the movement of the piston in one direction, the other end of said second rod portion extending centrally through and beyond said die portion, and a punch removably and centrally engaged upon said other end of the second rod portion, said punch having means thereon cooperating with the die portion in the operation of the

punch, the spacing between said sleeve and the shoulder at the junction of the bore passages being less than the spacing between said punch means and the end wall of said second chamber whereby engagement of said sleeve with said junction shoulder prevents said punch means from hitting said second chamber end wall.

JOHN C. NISCHAN.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
167,975	Barnes	Sept. 21, 1875
638,711	Higgins	Dec. 12, 1899
865,857	Bond	Sept. 10, 1907
1,033,505	White et al.	July 23, 1912
1,353,600	McBride	Sept. 21, 1920
2,221,904	Abramson	Nov. 19, 1940
2,456,236	Acton	Dec. 14, 1948
2,488,224	Mothorn	Nov. 15, 1949
2,542,305	Brinen	Feb. 20, 1951