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STRIPPING PUNCH

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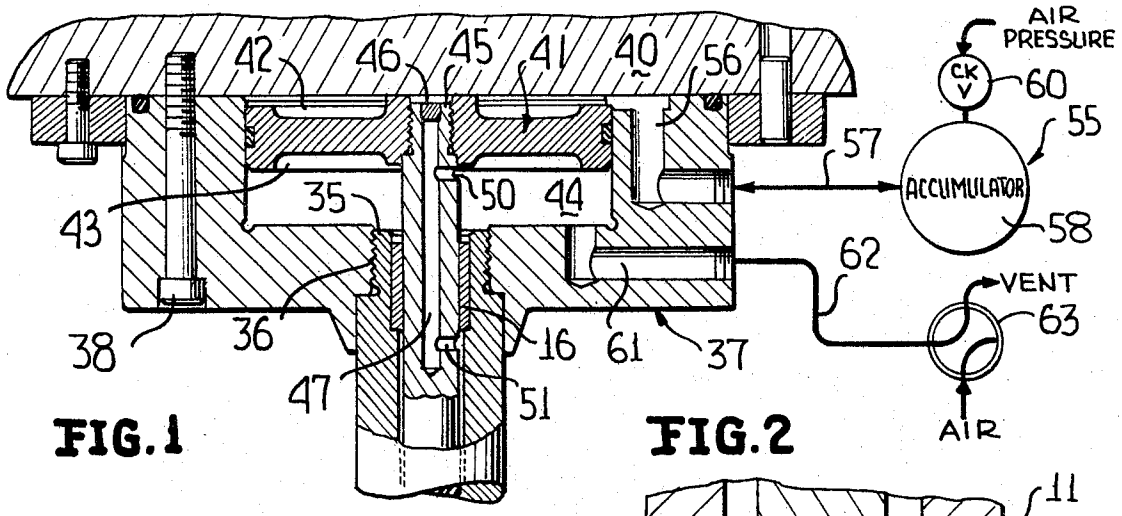
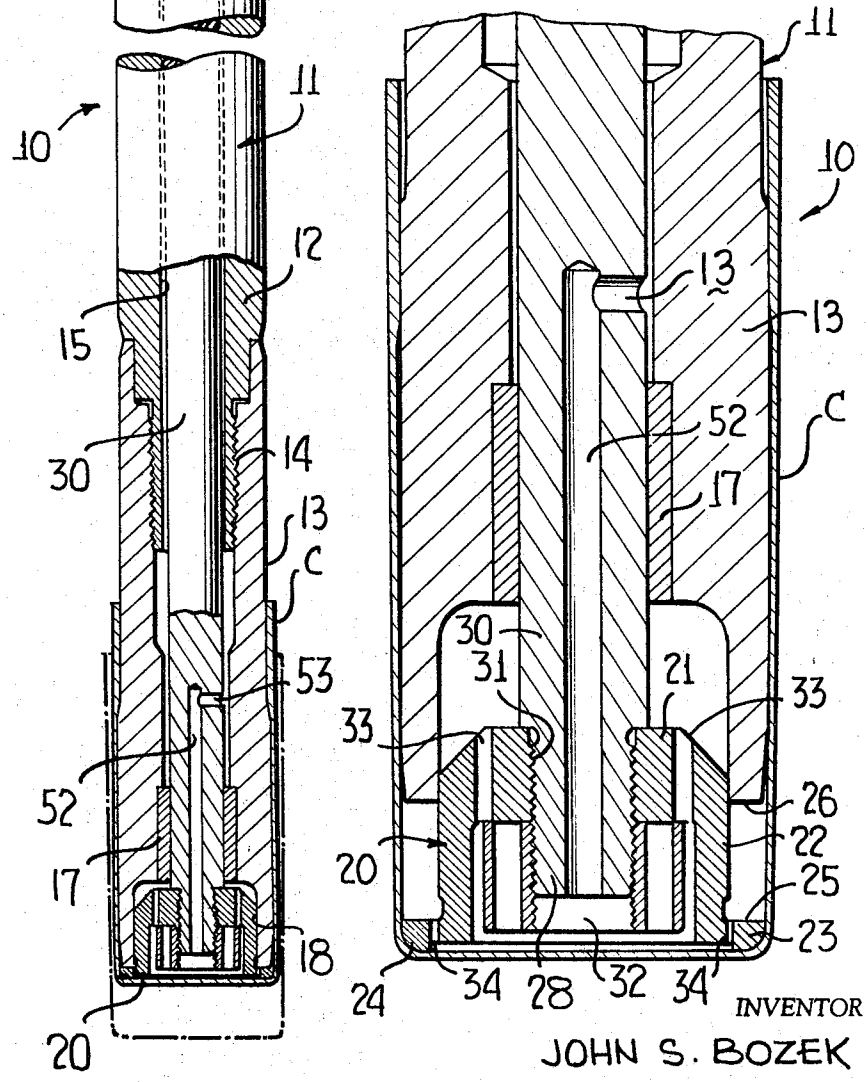


FIG. 1

FIG. 2



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STRIPPING PUNCH

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ABSTRACT OF THE DISCLOSURE

This disclosure relates to a punch for automatically stripping articles therefrom, and includes a main tubular body having a fluid cylinder at one end and a nose at an opposite end, the nose being connected by a piston rod to a piston within the cylinder, and a closed fluid pressure system acting against the piston to extend the nose to automatically strip a drawn article from the punch.

A primary object of this invention is to provide a novel punch for manufacturing drawn or wall ironed articles, the punch including a main body secured at one end to a fluid cylinder and carrying at an opposite end thereof an extendible and retractable nose, the nose being connected to a piston within the cylinder by a piston rod, and a closed fluid pressure system for normally urging the nose to its extended position whereby after the nose is moved to its retracted position by forces developed during a drawing operation the pressure of the fluid pressure system automatically extends the nose to cause a drawn article to be stripped therefrom.

A further object of this invention is to provide a novel punch of the type described wherein means are additionally provided for directing fluid pressure against the interior of a drawn article carried by the punch to augment the stripping thereof upon the movement of the nose to its extended position.

Still another object of this invention is to provide a novel punch of the type heretofore described wherein the fluid pressure directing means can alternatively function as means for venting air to the atmosphere from within an article during the drawing thereof.

With the above and other objects in view that will hereinafter appear, the nature of the invention will be more clearly understood by reference to the following detailed description, the appended claimed subject matter, and the several views illustrated in the accompanying drawing.

In the drawing:

FIG. 1 is a fragmentary side elevational view with parts broken away and shown in section of a novel punch of this invention, and illustrates a nose carried by a reciprocally mounted piston rod with the nose being illustrated in its retracted position.

FIG. 2 is an enlarged fragmentary sectional view of the lower end of the punch of FIG. 1, and illustrates the nose in its extended positon in which a drawn body is automatically stripped from the punch.

A novel punch constructed in accordance with this invention is fully illustrated in FIG. 1 of the drawing, and is generally designated by the reference numeral **10**. The punch **10** includes a two-piece main tubular body **11** formed by a pair of tubular sleeves **12, 13** threadably secured together at **14**. The tubular body **11** includes a bore **15** which is counterbored at opposite ends to form seats for a pair of bushings **16, 17**. Adjacent the counterbore (unnumbered) in which the bushing **17** is housed is an additional counterbore **18**.

A nose **20** (FIG. 2) is mounted for sliding movement in the counterbore **18** between a retracted position (FIG. 1) and an extended position (FIG. 2). The nose **20** includes a base portion **21**, a peripheral skirt **22** and a radially outwardly directed peripheral flange **23** which is provided with a rounded end face **24** and a flat annular surface **25** which axially opposes a flat annular surface **26** of the main body **11**. A reduced end portion **28** of a piston rod **30** is threadably received in a threaded bore **31** of the nose base **21** and is secured thereto by a locking nut **32**. The base portion **21** and the flange **23** of the nose **20** each includes a plurality of equally circumferentially spaced bores **33, 34**, respectively.

The upper end portion of the main body **11** includes a reduced threaded end portion **35** which is threadably secured in a threaded bore **36** of a fluid cylinder **37**. The fluid cylinder **37** is in turn secured by a plurality of bolts **38**, only one of which is illustrated, to a ram **40** of a conventional press (not shown). A piston **41** having opposite faces **42, 43** is housed within a fluid chamber **44** of the cylinder **37**, and a threaded bore of the piston is secured to a threaded reduced end portion **45** of the piston rod **30**. A plug **46** prevents fluid communication between an axial bore **47** of the piston rod **30** and the portion of the chamber **44** above the piston face **42**. The bore **47** is, however, placed in fluid communication between the portion of the chamber beneath the face **43** and an annular chamber between the piston rod **30** and the main tubular body **11** by a pair of radial ports **50, 51**. The same annular chamber is also placed in fluid communcation with an axial bore **52** (FIG. 2) at the lower end portion of the piston rod **30** by means of a radial port **53**.

The side of the chamber **44** above the face **42** of the piston **41** is placed in fluid communication with a closed fluid pressure system **55** by means of a passage **56** in the cylinder **37**, a conduit **57**, a conventional accumulator **58**, and a one-way check valve **60** which is connected to a conventional source of air pressure as, for example, a conventional compressor.

The portion of the chamber **44** beneath the end face **43** of the piston **41** is likewise connected to a source of air pressure or atmosphere by means of a passage **61**, a conduit **62** and a two-position valve **63** which can be manually or automatically manipulated to place the conduit **62** in communication with compressed air or the atmosphere.

A typical operation of the punch **10** is begun by opening the check valve **60** of the closed fluid pressure system causing compressed air to enter the portion of the chamber **44** above the piston **41** whereupon after the build-up of a predetermined pressure within the system **55**, the valve **60** is closed. At this point the piston **41** is, of course, in its lowermost position and the nose **20** is extended to the position illustrated in FIG. 2.

Assuming that a cup-shaped metallic blank is to be drawn or wall ironed, the blank is positioned in axial alignment with the punch and with the die opening (or openings) or one or a plurality of female drawing or wall ironing dies (not shown). As the ram **40** descends the extended nose **20** and the lower end portion of the main body **11** enter the cup-shaped blank and begin forcing the blank through the female die. As the blank begins moving through the female die the friction forces developed by the drawing or wall ironing operation and acting through the blank cause the blank and the nose **20** to be forced upwardly, the latter into the counterbore **18**, as shown in FIG. 1, at which point the surfaces **25, 26** are in abutment. The movement of the nose **20** to its retracted position forces the piston **41** to the position illustrated in FIG. 1 with the increase in fluid pressure in the system **55** being accommodated by the accumulator **58**.

Due to the contact between the surfaces **25, 26**, the nose **20** and the main body **11** are essentially equivalent to a rigid punch and during the continued simultaneous downward movement of the nose **20** and the body **11**,

the cup-shaped blank is progressively forced through the opening of the female die forming a drawn or wall ironed article C, which may be a can body or similar container. After the uppermost edge of the article C has passed beyond the female die opening the frictional and other forces of the drawing or wall ironing operation are terminated. At this time the forces tending to retain the article C upon the punch are overcome by the pressure within the fluid system 55 which, acting against the face 42 of the piston 41, forces the latter downwardly along with the piston rod 30 and the nose 20 to the position shown in FIG. 2 whereupon the nose 20 strips the article C from the end of the main body 11 by moving the article C axially downwardly, as shown in FIG. 2. Upon reaching the position shown in FIG. 2, gravity alone will in most cases be sufficient to cause the article C to simply drop off the end of the punch 10.

It should be noted that during the retraction of the nose 20 into the counterbore 18 any air which might otherwise become entrapped or compressed in the counterbore 18 or between the faces 25, 26 is vented to atmosphere through the bores 33, 34, the axial bore 52, the radial port 53, the annular gap between the piston rod 30 and the main tubular body 10, the radial port 51, the bore 47, the radial port 50, the portion of the chamber 44 beneath the piston face 43, the passage 61, the conduit 62 and the valve 63 positioned in the manner illustrated in FIG. 1. During the downward movement of the piston 41 incident to the stripping operation, air which otherwise might become entrapped beneath the face 43 of the piston 41 is also vented to atmosphere through the passage 61, the conduit 62 and the valve 63 in the position as shown in FIG. 1.

In order to augment the stripping operation of the nose 20, it might be found desirable to assist the stripping operation by "blowing" the article C from off the end of the punch 10 when positioned as shown in FIG. 2. To this end the valve 63 may be automatically or manually rotated to place the conduit 62 in fluid communication with a source of compressed air which will be conducted into the interior of the article C over a path defined by the source of compressed air, the valve 63, the conduit 62, the passage 61, the portion of the chamber 44 beneath the piston 41, the port 50, the bore 47, the port 51, the annular area between the piston rod 30 and the main tubular body 11, the port 53 and the bore 52. During this blowing operation it will be noted that the piston 41 is in its lowermost or bottom position at which point outermost flanges (unnumbered) of the piston 41 contact the opposing face (unnumbered) of the chamber 44. However, due to the relieved or recessed construction of the face 43 the air pressure delivered into the chamber 44 is readily conducted into the port 50.

While the operation of the punch 10 has been described in conjunction with the closed fluid system 55 and its accumulator 58, it is to be understood that the accumulator need not be a part of the fluid system 55 and in lieu thereof the conduit 57 could be directly connected to the check valve 60, which in this case is preferably a solenoid actuated valve. By positioning microswitches on the press or a pressure responsive valve in the line 57, the air pressure can be continually monitored and the solenoid valve 60 opened periodically to maintain the air pressure in the closed system at the desired level.

While preferred forms and arrangements of parts have been shown in illustrating the invention, it is to be clearly understood that various changes in details and arrangement of parts may be made without departing from the spirit and scope of the invention as defined in the appended claimed subject matter.

I claim:

1. A punch for manufacturing drawn articles comprising a main body adapted to be connected to a reciprocal press ram, a nose mounted at an end of said body for axial movement between extended and retracted positions, means for normally urging said nose to its extended position, and said urging means is a closed fluid system continuously pressurized during reciprocation of said body by said ram whereby the nose is moved to its retracted position by forces greater than that applied to said nose by said fluid pressure system developed during the drawing operation which overcome the pressure of the fluid pressure system and upon the termination of the drawing forces the pressure of the fluid pressure system automatically moves the nose to its extended position causing the drawn article to be stripped from the punch.

2. The punch as defined in claim 1 including means for directing fluid pressure against the interior of a drawn article carried by the punch to augment the stripping thereof upon the movement of said nose to its extended position.

3. The punch as defined in claim 1 wherein said main body includes a fluid cylinder at an end thereof opposite said nose, a piston in said cylinder, said fluid pressure system being connected to said cylinder to normally bias said piston in a direction toward said nose, and a means connecting said piston to said nose.

4. The punch as defined in claim 1 wherein said main body is tubular, a rod is mounted for reciprocal movement in said main body, and said nose is carried by said rod.

5. A punch for manufacturing drawn articles comprising a main tubular body having opposite ends, a fluid cylinder at one of said ends and a nose at the other of said ends adapted to be moved between extended and retracted positions relative to said main body, a piston in said cylinder, a piston rod connected to said piston and said nose, means for introducing fluid pressure into said fluid cylinder behind a face of said piston which is remote from said nose, means for introducing fluid pressure into said fluid cylinder behind the opposite face of said piston, and means for directing the fluid pressure so introduced behind said opposite face against the interior of a drawn article carried by the punch to augment the stripping thereof upon the movement of said nose to its extended position.

6. The punch as defined in claim 5 wherein said nose is at all times at least partially telescopically received in said other end of said main body.

7. The punch as defined in claim 5 including means for venting air to the atmosphere from within an article during the drawing thereof.

8. The punch as defined in claim 5 wherein said fluid pressure directing means can alternately function as means for venting air to the atmosphere from within an article during the drawing thereof.

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