Oct. 17, 1944. S. L. GOOKIN 2,360,337

PNEUMATIC CHIP EJECTOR

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Fig. 1

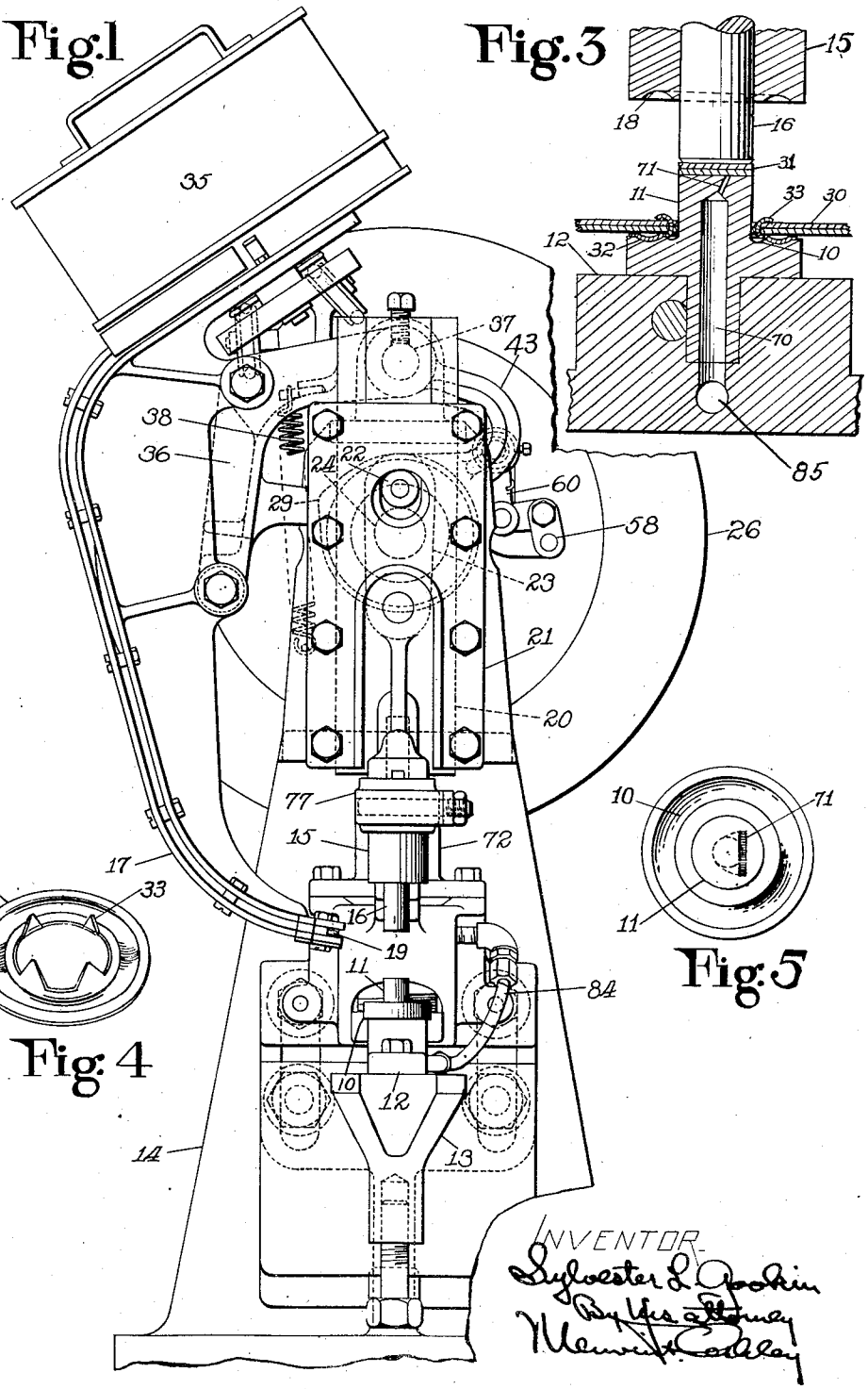


Fig. 3

Fig. 4

Fig. 5

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Fig 2

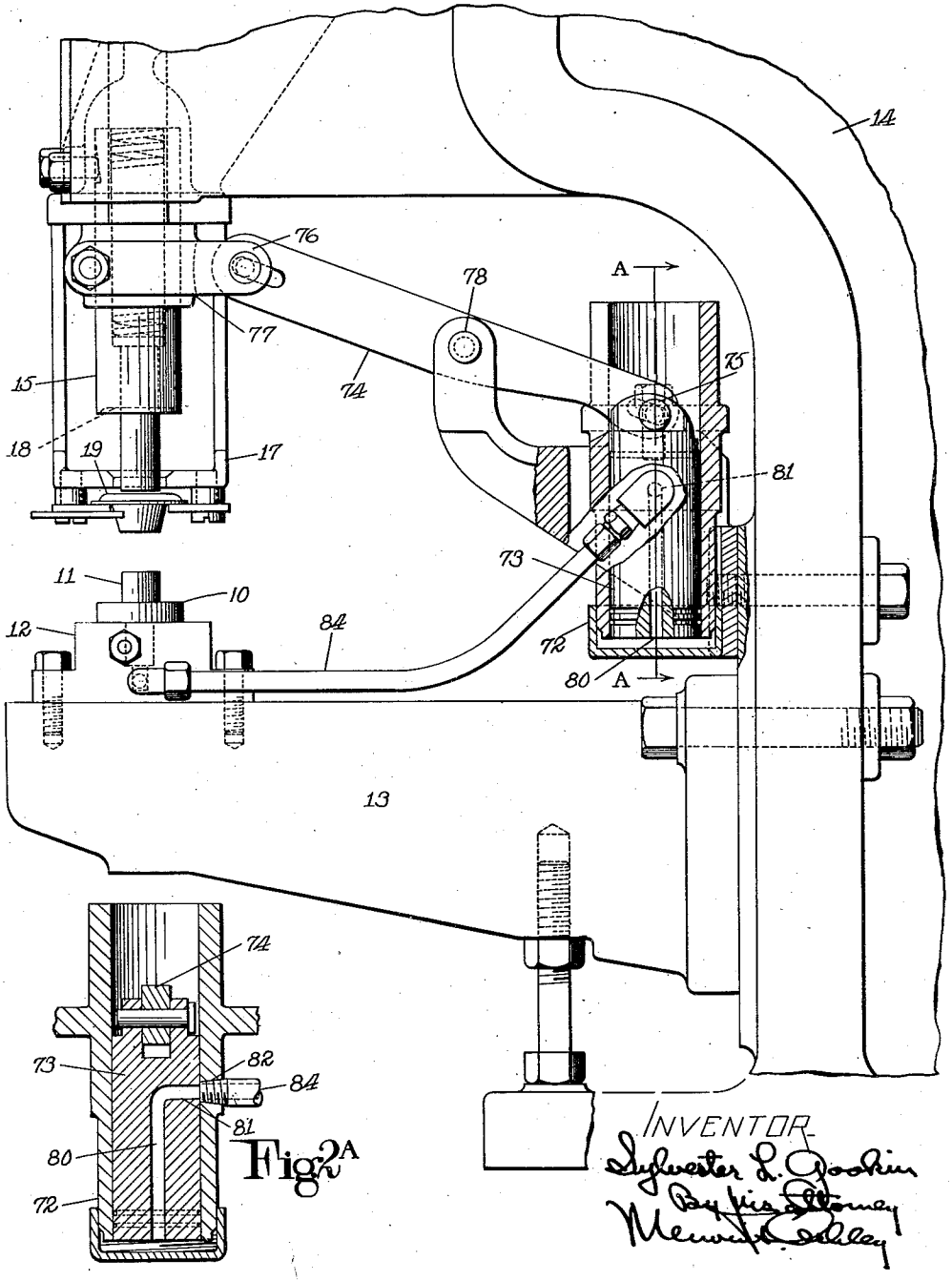


Fig 2A

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Patented Oct. 17, 1944

2,360,337

UNITED STATES PATENT OFFICE

2,360,337

PNEUMATIC CHIP EJECTOR

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Application November 20, 1942, Serial No. 466,258

2 Claims. (Cl. 164—33)

The purpose of the present invention is to provide improved means for ejecting small pieces of sheet material from the tools that produce them in consequence of punching holes in such material. A typical example of work for which the improved means is intended is encountered in the manufacture of canvas products to be provided with grommets. Tents, awnings, tarpaulins, floor coverings and sails are in this category.

A grommet-setting machine now used extensively for such work is illustrated and described in United States Letters Patent No. 2,182,021, granted December 5, 1939, on my application, but it is to be noted that the tools shown in that patent are of a size and design that pierce the sheet material (usually canvas) with sharp points without producing chips or small individual pieces. On the other hand, when the work requires larger grommets the punching operation requires tools capable of punching out circular pieces or chips to provide holes large enough to receive the grommets, and these pieces or chips, if left in the path of the ingoing grommets, become caught by the latter and fastened to the work. When this occurs the grommets are unevenly and insecurely clenched.

Again referring to the patent above mentioned, the machine under consideration is so organized and controlled that every run thereof produces two operating strokes of one of the punching and setting tools to fulfill an operating cycle. The first stroke of each run is utilized to punch a small piece from the work without inserting a grommet, but the second is utilized to insert a grommet and clench it. The time interval between the first and second operating strokes is too short to enable an operator to remove a chip from the path of an ingoing grommet, but the invention herein set forth provides improved means by which a blast of compressed air is utilized to effect such removal.

A feature of the invention is embodied in a punch having an air duct that terminates in an emission port in the surface of the punching end thereof, and means for supplying compressed air through the duct to be emitted against a chip obstructing the port.

Another feature is embodied in means operable by the punching mechanism for compressing a charge of air and postponing its release until the termination of the compressing stroke, whereupon the compressed charge is suddenly admitted into the air duct of the punch and emitted at high pressure through the emission port.

Referring to the drawings,

Fig. 1 is a front elevation of a punching and grommet-setting machine in which the invention is embodied;

Fig. 2 is a side elevation, viewed from the right, of a front portion of the machine including a sectional view of the air compressor;

Fig. 2A is a section of the air compressor on line A—A of Fig. 2;

Fig. 3 is a vertical section of the punching members and a work piece as having been punched by them. The punched-out chip remains on the upper end of the punch;

Fig. 4 is a perspective view of a washer such as the one included in Fig. 3; and

Fig. 5 is a top plan view of the combined punch and setting tool included in Fig. 3.

To provide a basis for the novel subject matter the description will first set forth the essential features and mode of operation of the machine for punching holes and setting grommets. Some details not herein described may be obtained from the description in the aforesaid Patent No. 2,182,021.

A fixed tool (Figs. 1, 2, 3 and 5) is provided with an annular upsetting surface 10 constituting an anvil, and an upstanding central portion 11 constituting a punch. It is secured to a block 12 and the latter is fastened to a horn 13 which constitutes a part of the frame 14. A die member 15 cooperates with the punch 11, but its bore is provided with a spring-pressed spindle 16 which first ejects a punching from the bore and later picks a grommet from a raceway 17. The surface 18 of an annular groove in the die member constitutes a seat for the flange 19 of a grommet (Fig. 2).

The die member 15 is carried toward and from the anvil by a plunger 20 arranged in a guideway in the frame and confined therein by a cover plate 21. The plunger 20 is connected to an operating crank 22 by a link 23. A shaft 24 journaled in the frame 14 carries the crank and the driven member of a clutch. The driving member 26 of the clutch is in the form of a pulley to be driven by a belt (not shown) and is loosely mounted on the shaft at the rear of the driven member.

According to the conditions represented in Fig. 3 the die member 15 is at an intermediate point of its first counterstroke, the circular piece 31 of sheet material cut from the work 30 remains on the upper end of the punch 11 and is

clamped there by the spring-pressed spindle 16 which is about to be raised to release it. If strong anchorage of the grommet is required the operator will place a washer 32 on the anvil 10 before placing the work 30 on the punch, and if the washer has prongs 33 these will be clenched by the surface 18 of the die member during the punching stroke, only to be covered and more tightly clenched by the flange of a grommet brought down during the setting stroke.

The raceway 17, provided with a hopper 35 for grommets, is affixed to a carrier 36 (Fig. 1), and the carrier is connected to the frame 14 by a rod 37 that constitutes a pivot. A tension spring 38 normally pulls the delivery end of the raceway into the path of the spindle 16.

The machine herein described operates in the same manner as that described in the aforesaid Patent No. 2,182,021, insofar as the raceway, the starting and the stopping are concerned. The novel subject matter now to be described is provided to remove the piece 31 (Fig. 3) from the punch and from the path of the ingoing grommet. This removal is timed to occur at the conclusion of the first counterstroke of the die member 15, at which point in the operating cycle the spring-pressed spindle 16 is at the level represented in Fig. 2.

The punch 11 is provided with an air duct 70 and a slanted emission port 71 in the surface of its punching end. A slanting jet of air emitted from the port will blow the piece 31 to one side of the path of an ingoing grommet. An air-compressor shown in Fig. 2 includes a stationary cylinder 72 and a vertically movable piston 73. The cylinder is secured to the frame 14. Its lower end is closed but its upper end is open and provided with a notch to receive an operating lever 74. One end of the lever has a pin-and-slot connection 75 with the piston and the other end has a similar connection 76 with a collar 77 surrounding the die member 15 and clamped thereto. The fulcrum 78 of the lever is stationary. The piston is operated in synchronism with the strokes of the die member and the charges of air are compressed as the die member rises.

An air duct 80 in the piston has a vertical run extending upwardly from its lower end to a horizontal run or port 81 in the cylindrical surface. This port registers with a port 82 in the cylinder only when the piston is at the lower limit of its range. When the piston rises a partial vacuum is created in the lower part of the cylinder until the port 82 is uncovered by the piston, whereupon a charge of air is sucked into the cylinder through a metal tube 84. This occurs at the conclusion of the punching stroke of the die member 15. When the piston descends it closes the port 82 and compresses the charge of air until the port 81 registers with the port 82, whereupon the compressed charge is released suddenly and at maximum pressure. The released air then flows through the tube 84, thence through a duct 85 in the block 12 (Fig. 3), through the duct 70 in the punch member 11 and through the emission port 71.

The piece 31, punched during the first downstroke of the die member 15, enters the bore of the latter during that stroke but is forced out of the bore by the spring-pressed spindle 16 during the first up-stroke. In fact, the spindle clamps the piece against the punch and in a position to cover the emission port 71 until the first up-stroke is about one-half spent, after which the spindle leaves the chip in that position to receive the full force of the jet of air.

At the conclusion of the first up-stroke the spring 38 shifts the raceway to present a grommet. Consequently, during the second downstroke of the die member 15 the spindle will take a grommet from the raceway and guide it to the punch 11, and the die member will force the barrel of the grommet through the work 30 and clench it against the anvil 10.

Having described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. A punching machine comprising a punch member and a cooperative die member arranged to punch a piece out of sheet material, said punch member having an emission port in its punching end and an air duct terminating in said port, means for operating one of said members, means operable by said operating means for compressing a charge of air and releasing it at the conclusion of the compressing stroke, and means for conducting the released air to said duct.

2. A punching machine comprising a punch member and a die member one of which is movable toward and from the other to sever a piece from sheet material, the punch member having an emission port in its punching end and the die member having a spring-pressed member arranged to eject a punching therefrom, cooperative air-compressing members, one a piston and the other a cylinder and one movable with respect to the other, means arranged to reciprocate said movable members in synchronism, and means forming a communication duct from said cylinder to said emission port, the piston and the cylinder being arranged to compress a charge of air during the counterstroke of the movable punching member and having cooperative ports arranged to release the compressed charge into said communication duct at the conclusion of said counterstroke.

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