

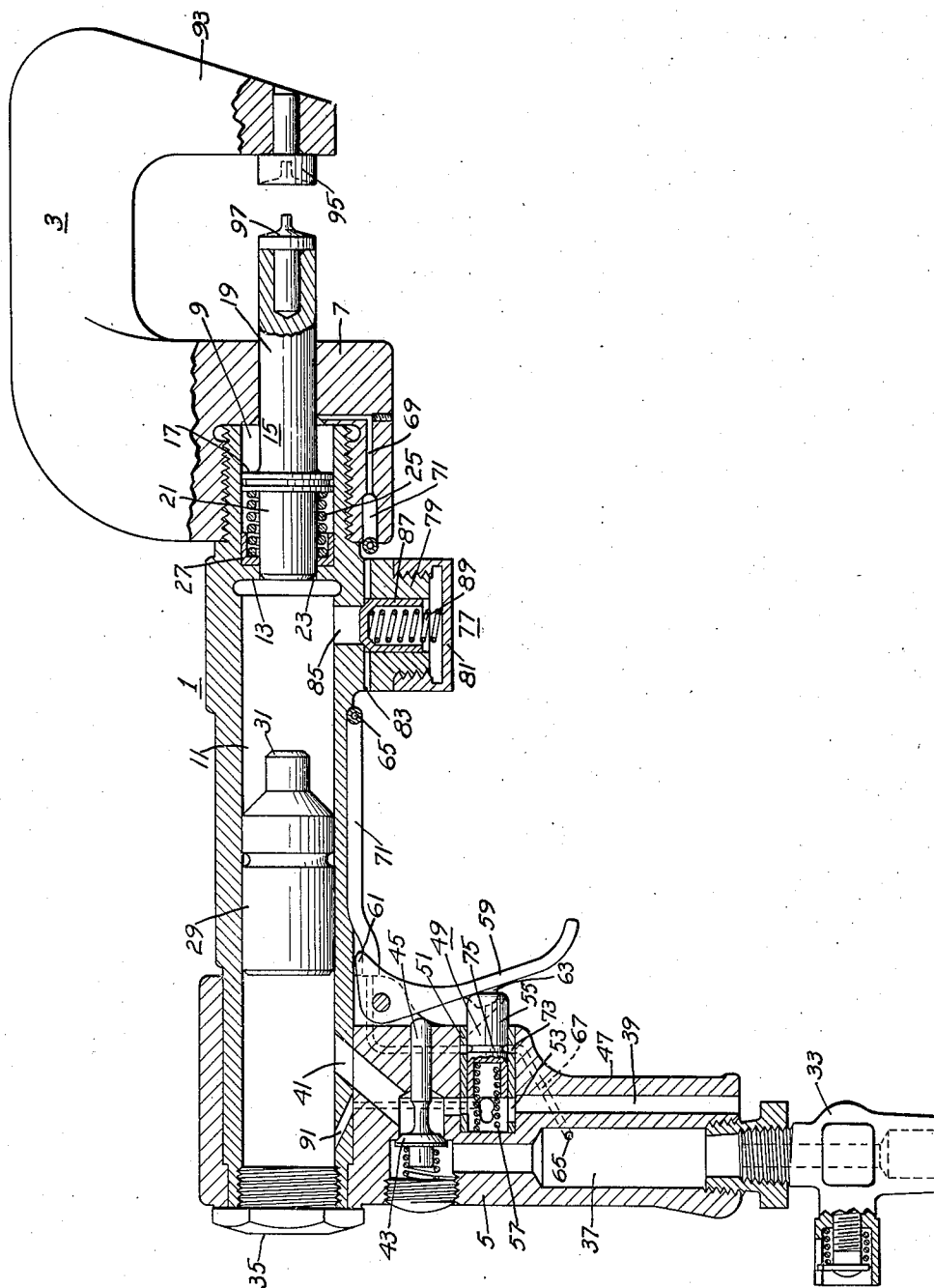
April 17, 1945.

W. KAHLER ET AL

2,374,019

MACHINE FOR DIMPLING OR THE LIKE

Filed Nov. 13, 1942



INVENTORS,
WILLIAM KAHLER
FRED H. LATHROP
BY

Lippincott & Metcalf

ATTORNEYS.

UNITED STATES PATENT OFFICE

2,374,019

MACHINE FOR DIMPLING OR THE LIKE

William Kahler, Los Angeles, and Fred H. Lathrop, San Dimas, Calif., assignors to Northrop Aircraft, Inc., Hawthorne, Calif., a corporation of California

Application November 13, 1942, Serial No. 465,812

7 Claims. (Cl. 153—21)

Our invention relates to machines for performing dimpling operations or the like on sheet material, and has for its objects:

(1) To provide a novel and improved dimpling machine or the like.

(2) To provide a novel and improved dimpling machine or the like wherein the sequential movements of a tool and impact means are inherent in the machine.

(3) To provide a novel and improved dimpling machine or the like offering maximum assurance to an operator against injury.

(4) To provide a novel and improved dimpling machine or the like incapable of functioning in improper sequence, whereby danger of faulty operation and breakage of parts is avoided.

(5) To provide a novel and improved dimpling machine or the like which is conveniently portable by the operator during use.

Additional objects of our invention will be brought out in the following description of a preferred embodiment thereof, taken in conjunction with the accompanying drawing wherein the figure is a view in section through such preferred embodiment of our invention.

The body or framework of the machine comprises a cylinder or barrel 1 to one end of which is mounted a yoke 3, while the other end carries a handle 5 depending therefrom.

The yoke 3 is of inverted U-shape with one leg 7 thereof recessed and threaded for attachment to the front end of the cylinder or barrel 1. The cylinder is divided into a front chamber 9 and a rear chamber 11 by a partition 13.

A tool 15, in the form of a cylindrical rod, provided with an intermediate flange 17, is reciprocally supported in the front chamber 9 with the flange 17 acting as a piston therein. One end 19 of the tool slidably extends through an opening in the recessed portion of the leg 7 of the yoke 3. The rear portion 21 of the tool is adapted to enter an opening 23 in the partition 13 on return strokes of the tool. A compression spring 25 is disposed about the rear portion of the tool between a thrust washer 27 fitting up against the partition 13, and the rear surface of the flange 17.

In the rear chamber 11 of the cylinder or barrel, we provide a free piston or hammer 29 having a reduced end 31 capable of entering the opening 23 in the partition 13 to impact the rear end of the tool 15, as a part of the operating schedule of the machine.

The machine utilizes compressed air in its operation, and to this end compressed air is introduced into the machine through the handle 5 from some

external source (not shown) by way of a suitable fitting 33, and the compressed air is controlled through a system of valves and passages incorporated in the handle.

The handle 5 is preferably mounted on the cylinder 1 by sliding one end of the handle over the end of the cylinder and holding it in position by an end nut 35 threaded into the rear end of the cylinder. The handle includes an air intake passage 37 connecting with the source of compressed air externally of the machine, and an exhaust passage 39 discharging to the atmosphere at the lower end of the handle. Both the intake and exhaust passages merge into a common passage 41 entering into the rear chamber 11 of the cylinder.

The intake passage 37 is normally cut off from the common passage 41 by a spring biased throttle valve 43 having a valve stem 45 protruding slightly beyond the front wall 47 of the handle. The exhaust passage 39, on the other hand, is normally maintained in open communication with the common passage 41 by a normally open exhaust valve 49. Such exhaust valve comprises a stationary sleeve 51 fitted into the handle and intersecting the exhaust passage 39, but having perforations 53 through the walls thereof in line with the exhaust passage to permit of normal communication with the common passage 41 to the cylinder. A pin 55, slidably fitting in the sleeve 51, has a hollow end to receive a compression spring 57 for normally biasing this pin beyond the perforations 53 in the sleeve to establish the open condition of the valve, with the pin extending beyond the front wall 47 of the handle.

The extent to which this pin protrudes beyond the front wall of the handle is determined by a trigger 59 which is pivoted to the handle adjacent the cylinder and has its forward swing limited by an integral stop 61 abutting against the lower surface of the cylinder. At its maximum forward position, the trigger is in spaced relationship to the exposed end of the throttle valve stem 45 while the pin 55 of the exhaust valve is maintained in pressure contact or engagement with the trigger by the compression spring 57 of the exhaust valve. Therefore, upon pulling the trigger, the exhaust valve 49 and the throttle valve 43 will be operated sequentially in the order named, such operation bringing about a closing of the exhaust valve, followed by an opening of the throttle valve. To assure maintenance of proper alinement between the trigger 59 and the pin 55 of the exhaust valve, the engaging face of the pin may be notched to receive a guide extension 63 on the trigger.

A restricted air passage 65 is provided, which connects the intake passage 37 of the handle with the front chamber 9 of the cylinder ahead of the tool flange 17. This restricted passage is formed of a bore 67 through the handle and a bore 69 in the leg 7 of the yoke, connected by a length of tubing 71. The bore 67 in the handle intersects the sleeve 51 and pin 55 of the exhaust valve. The sleeve is provided with diametrical perforations 73 in alinement with the bore while the pin is formed with a peripheral groove 75 which is so located as to come into alinement with the perforations 73 in the open position of the valve.

On the cylinder 1, just behind the partition 13, we provide a relief valve 77 comprising a hollow integral boss 79 having a cover 81 threaded thereon at its exposed end. This boss is provided with a plurality of air passages 83 extending laterally from the passage 85 through the boss, which passage is of enlarged diameter beyond the lateral air passages to receive a hollow valve 87. This hollow valve is maintained normally against the seat formed by the smaller diameter portion of the passages 85 through the boss by a compression spring 89 installed within the valve 87 and bearing against the boss cover 81. In its closed condition, the relief valve closes the air passages 83.

In the normal non-operating condition of the machine, the intake passage 37 to the cylinder is blocked by the throttle valve 43, while the discharge passage from the cylinder is open through the exhaust valve 49. Under the same conditions, the fore part of the front chamber 9 is exposed to air under compression through the restricted passage 65 from the air intake passage in the handle to the front chamber, thereby causing the tool to be retracted into the cylinder to the maximum extent permitted by the compression spring 25 behind the flange 17. By providing a loose or leaky fit between the flange 17 and the inner wall of the front chamber, and between the rear portion 21 of the tool and the partition 13, air will leak over into the rear chamber 11 and build up a pressure therein sufficient to force the piston 29 to the rear end of its chamber. The figure of the drawing illustrates the tool in its retracted position and the piston in the middle of its return stroke.

The pressure in the rear chamber, however, if permitted to build up to the extent of equalizing the pressure on the front surface of the tool flange 17, would free the compression spring 25 of any restraint, and cause the same to urge the tool to its maximum forward position. As this is not desired, the relief valve 77 is designed to open up at a value of pressure somewhere in between that pressure necessary to move the piston 29 back to the rear end of its chamber 11 and that value which will provide the proper differential pressure necessary to overcome the spring 25 and hold it in compression. Thus, in the non-operating condition of the machine, the tool will remain in its restricted position, with the piston held against the rear end of its chamber.

A restricted exhaust passage 91 extending from the rear extremity of the piston chamber 11 and connecting with the exhaust passage 39 through the exhaust valve 49, will prevent the formation of an air cushion behind the piston during movement of the piston toward the rear end of the chamber.

Upon pulling the trigger 59 only to the extent

of shutting off the exhaust valve 49, not only is the discharge passage 39 blocked, but also the restricted passage 65 to the front chamber 9 of the cylinder. This cut-off of pressure from the front chamber, occasioned by the shutting off of the supply of air thereto, gradually causes a loss in pressure sufficient to permit the spring 25 to exercise its function of urging the tool to its most forward position.

Further movement of the trigger opens the throttle valve 43, thereby exposing the piston 29 to the full force of the compressed air entering the intake passage 37 from the external source of supply. The piston is thus thrust forward with full impact against the rear end of the tool, the relief valve 77 functioning during the forward thrust of the piston to preclude the building up of compression in the cylinder ahead of the piston.

Upon release of the trigger, the piston will be returned to the rear end of its chamber, and the tool will be retracted and held in its retracted position, all as previously described.

Where the machine is to be employed for dimpling, the free end 93 of the yoke is perforated to receive the female part 95 of a dimple set while the tool is recessed to receive the male component 97.

A sheet of metal to be dimpled is usually provided with a perforation at the point at which a dimple is to be formed, and such sheet is positioned between the dimpling dies with the perforation in the path of movement of the tool so that during the initial portion of the trigger movement, the tool will be urged forward and the sheet material will be clamped between the male and female dies with the male member entering the perforation in the sheet material. The subsequent impact of the piston against the rear end of the tool, brought about by the completion of the trigger movement, produces the desired dimple in the sheet material. Upon release of the trigger, the dimpling dies will be separated and the material can be removed.

It is apparent that the machine is applicable for other purposes than dimpling, such purposes being realizable merely by the substitution of dies of a different character from those employed for dimpling purposes. Consequently, while the machine has been referred to as employed for dimpling purposes, it is understood that its utility is not limited to this particular purpose. While we have described a preferred embodiment, the same is subject to modification and alteration without departing from the underlying principles of our invention, and we accordingly do not desire to be limited in our protection to the details disclosed in our description except as may be necessitated by the appended claims.

We claim:

1. A portable machine for dimpling or the like comprising a tool for engagement with work to be operated on, a compression spring normally biasing said tool in the direction of such work, means normally supporting said tool in spaced relationship to such work against the action of said spring under compression; a hammer for impacting said tool; and control means common to the control of said tool and said hammer for removing the restraint upon said spring movement of said tool into engagement with said work and sequentially causing movement of said hammer to impact said tool after such engagement.

2. In a machine for dimpling or the like, a cyl-

inder, a tool reciprocally mounted in one end of said cylinder, a spring in said cylinder normally biasing said tool toward a forward position for engagement with work to be operated on, means for directing compressed air against said tool in opposition to said biasing spring and at a pressure sufficient to overcome said spring and force said tool rearwardly into said cylinder, and means for reducing said air pressure at will to render said spring effective in urging said tool to its forward position against work to be operated on.

3. In a machine for dimpling or the like, a cylinder, a tool reciprocally mounted in one end of said cylinder, a spring in said cylinder normally biasing said tool toward a forward position for engagement with work to be operated on, means for directing compressed air against said tool in opposition to said biasing spring and at a pressure sufficient to overcome said spring and force said tool rearwardly into said cylinder, means for reducing said air pressure at will to render said spring effective in urging said tool to its forward position against work to be operated on, and means for impacting said tool upon its engagement with such work.

4. In a machine for dimpling or the like, a cylinder, a tool reciprocally mounted in one end of said cylinder, a spring in said cylinder normally biasing said tool toward a forward position for engagement with work to be operated on, means for directing compressed air against said tool in opposition to said biasing spring and at a pressure sufficient to overcome said spring and force said tool rearwardly into said cylinder, means for reducing said air pressure at will to render said spring effective in urging said tool to its forward position against work to be operated on, means for impacting said tool upon its engagement with such work, and means for restoring said impacting means and said tool to their previous positions for a subsequent and similar operation.

5. A machine for dimpling or the like comprising a cylinder, a yoke mounted at the front end of said cylinder, a tool reciprocally supported within said end of the cylinder and slidably extending through one side of said yoke, a spring within said cylinder normally biasing said tool toward a forward position for engagement with work positioned between the legs of said yoke, a free piston in said cylinder to the rear of said tool, means for admitting air under pressure against said tool in opposition to said spring and at a pressure sufficient to overcome the spring and force said tool to rearward position, means providing a leak passage for said air under pressure to the rear of said tool whereby to develop pressure to force said free piston to the rear end of said cylinder, a relief valve in the wall of said cylinder between said piston and said tool, adjusted to open at a pressure in excess of that necessary to force said piston back but sufficiently below the air pressure against said tool to hold said tool at its rearward position, and means

for reducing the air pressure against said tool and creating a sudden increase in air pressure behind said free piston whereby said tool can move in the direction of such work and be impacted by said free piston.

6. A machine for dimpling or the like comprising a cylinder, a yoke mounted at the front end of said cylinder, a tool reciprocally supported within said end of the cylinder and slidably extending through one side of said yoke, a spring within said cylinder normally biasing said tool toward a forward position for engagement with work positioned between the legs of said yoke, a free piston in said cylinder to the rear of said tool, means for admitting air under pressure against said tool in opposition to said spring and at a pressure sufficient to overcome the spring and force said tool to a rearward position, means providing a leak passage for said air under pressure to the rear of said tool whereby to develop pressure to force said free piston to the rear end of said cylinder, a relief valve in the wall of said cylinder between said piston and said tool, adjusted to open at a pressure in excess of that necessary to force said piston back but sufficiently below the air pressure against said tool to hold said tool at its rearward position, and trigger operable means for sequentially reducing the air pressure against said tool and creating a sudden increase in air pressure behind said free piston whereby said tool will move into engagement with work and be impacted by said free piston.

7. A machine for dimpling or the like comprising a cylinder, a yoke mounted at the front end of said cylinder, a tool reciprocally supported within said end of the cylinder and slidably extending through one side of said yoke, a spring within said cylinder normally biasing said tool toward a forward position for engagement with work positioned between the legs of said yoke, a free piston in said cylinder to the rear of said tool, means for admitting air under pressure against said tool in opposition to said spring and at a pressure sufficient to overcome the spring and force said tool to rearward position, means providing a leak passage for said air under pressure to the rear of said tool whereby to develop pressure to force said free piston to the rear end of said cylinder, a relief valve in the wall of said cylinder between said piston and said tool, adjusted to open at a pressure in excess of that necessary to force said piston back but sufficiently below the air pressure against said tool to hold said tool at its rearward position, trigger operable means for sequentially reducing the air pressure against said tool and creating a sudden increase in air pressure behind said free piston whereby said tool will move into engagement with work and be impacted by said free piston, and means for restoring said free piston and said tool to their previous positions in said cylinder.

WILLIAM KAHLER,
FRED H. LATHROP.