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CYCLE CONTROLLING DEVICE

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Fig. 1

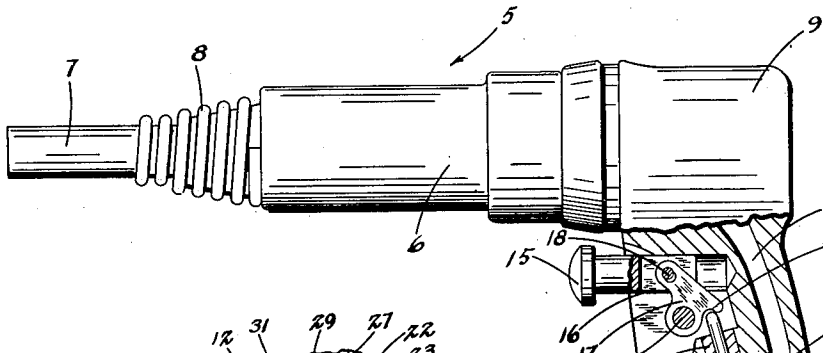


Fig. 2

INVENTORS
PAUL VAN SITTERT
WILLIAM KOVACS
BY
ATTORNEY

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CYCLE CONTROLLING DEVICE

Paul Van Sittert, Shaker Heights, and William R. Kovacs, Cleveland, Ohio, assignors to The Cleveland Pneumatic Tool Company, Cleveland, Ohio, a corporation of Ohio

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3 Claims. (Cl. 137—139)

The present invention relates broadly to fluid actuated tools in general, but more particularly to fluid actuated riveting hammers of the type used for upsetting rivets. Still more particularly, this invention deals with an improved cycle control or timing device for fluid actuated riveting hammers.

The primary object of the invention is to provide an improved mechanism which will control the cycle of operation of a riveting hammer to an extent whereby pressure will be gradually applied to accelerate the hammer for upsetting the rivet and as soon as the pressure reaches a predetermined maximum, the cycle will be automatically terminated, thereby shutting off the pressure to the hammer.

Another object of the invention is to provide a mechanism having the above characteristics which can be attached to, or incorporated in, the handle of a fluid actuated riveting hammer with but slight modification of the tool.

A further object of the invention resides in the provision of an improved cycle control or timing device for fluid actuated riveting hammers which functions to deliver a predetermined time cycle and then stops, thus accurately producing rivet bucktails of uniform height and diameter.

Other objects and advantages more or less ancillary to the foregoing reside in the specific construction and aggroupment of the elements peculiar to this structure, as will become apparent from a more complete examination of this specification.

In the drawing which illustrates the invention:

Fig. 1 is a side elevational view of a riveting hammer embodying the invention, the handle and attachment being in section to show details of construction.

Fig. 2 is a view of a portion of the handle shown in Fig. 1 with the parts in another position.

Referring to the drawing for a more detailed description thereof, a fluid actuated riveting hammer is generally designated by the reference numeral 5 and includes a cylinder 6 having a piston (not shown) reciprocable therein and active on a rivet set 7 which is operatively mounted within the front end of the cylinder 6 and secured in position by a suitable retainer 8. To the cylinder 6 is threaded, or otherwise affixed, a handle 9 provided in its upper end with a vertically extending passage 10 which leads into the cylinder 6 for admitting motive fluid such as compressed air therein to effect reciprocation of the piston. The passage 10 at its lower end communicates with a relatively large cylindrical bore 11, and extending diagonally therefrom toward the lower end of the handle is a passage 12. Motive fluid is admitted into the passage 10 through the threaded connection 13 from which extends a gooseneck coupling 14.

The handle 10 is provided with a trigger 15 which is mounted for slidable movement within a bore 16 formed in said handle adjacent its connection with the cylinder 6. As is to be understood, the trigger 15 is adapted to be depressed by the operator of the tool for admitting fluid to the cylinder 6 for effecting reciprocation of the piston housed therein. A lever 17 is pivotally connected at one end by pin and slot means as indicated at 18 to the trigger 15 and the other end thereof connected at 19 to the handle 9. The lever 17 is formed with a cam-like projection 20 which normally engages the upper end of a slidably supported rod 21 for a purpose to be hereinafter more fully described.

The lower end of the handle 9 is formed with an interiorly threaded opening 22 which communicates with the bore 11 and receives one end 23 of a housing 24, the other end 25 of said housing being interiorly threaded as indicated at 26 for attachment with the end of a motive fluid supply conduit (not shown).

The housing 24 is adapted to contain and support the improved mechanism for automatically controlling the cycle of operation of the riveting hammer to an extent whereby pressure fluid will be gradually fed to the cylinder 6 for accelerating the rivet set 7 and the pressure gradually built up until a predetermined maximum has been reached at which time the cycle will be automatically terminated. The mechanism for accomplishing this function includes a tubular shaped plunger 27 slidable within a bore 28 and having one end 29 projecting into the bore 11. The rod 21 is integral with, and extends from, the end 29 through a bushing 30. Depressing the trigger 15 will effect contact of the lever 17 with the end of the rod 21 and will urge said rod and its plunger 27 downwardly within the bore 28. A compression spring 31 surrounds the plunger 27 within the bore 11 and normally maintains said plunger in the inoperative position shown in Fig. 1 of the drawing.

The lower end of the plunger 27 is of reduced diameter as indicated at 32 and said reduced end is formed with a channel 33 for slidably supporting a stem 34, said stem being formed with a slot 35 for receiving a pin 36 which projects from the reduced end 32. This construction permits the stem 34 to move with the plunger 27 in a manner to be hereinafter more fully described. The stem

34 carries a piston-like member 37 and said member is normally urged downwardly by means of the compression spring 38.

The threaded opening 26 communicates with a relatively large recess 39, the outlet of which is controlled by means of a valve 40 and spring 41, said spring acting to retain the valve on its seat. The valve 40 is operatively connected with the member 37 by means of a pair of links 42 and 43. Link 42 is pivotally connected at 44 to the member 37, while the link 43 is pivotally connected to the valve 40 as indicated at 45. The adjoining ends of the links 42 and 43 are pivotally connected as indicated at 46 and a pin 47 projects from the member 37 for guiding and maintaining said links in a vertical position upon downward movement of the plunger 27.

Projecting from the bore 28 is a horizontally extending passage 48 which communicates with a relatively large bore 49 through the recess 54, said bore 49 being arranged in parallel relation with the principal portion of the passage 48. Slidably mounted within the bore 49 there is a valve 50 backed by a compression spring 51 and said valve is formed with a tapered or conical portion 52 which is integral with a piston 53 of a diameter substantially equal to the diameter of the bore 49. In the inoperative position shown in Fig. 1 of the drawing, the valve 50 acts to completely close the recess 54. The bore 49, intermediate its ends, is slightly enlarged as indicated at 55 from which radiates an outlet 56 leading into a horizontal passage 57. At a point diametrically opposite from the outlet 56, the passage 57 is provided with a coupling 58 which forms the other end of the gooseneck connection 14. From the construction just described it will be understood that with the valve in open position, air under pressure is free to flow through the passage 48 into the bore 49 through the outlet 56 and into the gooseneck coupling 14. The inner end of the bore 49 communicates with a restricted passage 59 which passage extends from, and communicates with, the passage 48. This permits a portion of the fluid that would normally flow through the passage 48, to flow through the passage 59 for action upon the piston 53 to move said piston and its connected valve toward the Fig. 2 position against the tension of the spring 51 thereby uncovering the recess 54 to allow the fluid to enter the bore and be discharged therefrom through the opening 55 and outlet 56. As the valve 50 is being moved to the Fig. 2 position, the tapered portion 52 will control the flow of fluid to the hammer to an extent whereby the fluid will be gradually fed to the hammer and the pressure gradually built up until the tapered portion has reached the position permitting the opening 54 to be completely uncovered, at which time maximum pressure will be applied to the hammer.

The passage 57 has one end closed by means of a screw plug 60 and said plug slidably supports a rod 61 to which is attached a cylinder 62. A head 63 is formed on the projecting end of the rod 61 and interposed between said cap and the plug 60 is a compression spring 64 for normally urging the rod outwardly or away from the housing 24. The tension of the spring 64 can be adjusted through the nut 60. The cylinder 62 is slidable within the passage 57 and its outward movement is limited by means of a stop 65. The passage 57 communicates with the atmosphere through a vent opening 66 and a similar vent opening 67 is provided for connecting the bore 49 with the atmosphere. The rod 61 is slidable in a passage 69 which is a continuation of the passage 57 and projects into the bore 28 at a point in line with the pivotal connection of the links 42 and 43.

In the operation of the device, the parts are normally all in the relation and position shown in Fig. 1 of the drawing. After positioning the rivet set 7 adjacent the rivet to be upset, the operator depresses the trigger 15 to urge the rod 21 and plunger 27 downwardly through the medium of the lever 17. Downward movement of the plunger 27 causes the stem 34 and member 37 to be moved downwardly and carried therewith are the links 42 and 43 and the valve 40. This downward movement unseats the valve 40 and motive fluid under pressure from the supply line enters the passages 48 and 59 simultaneously. The fluid entering the passage 59 will act upon the piston 53 to urge the same outwardly against the tension of the spring 51 thereby allowing the fluid from the passage 48 to be admitted through the recess 54 into the bore 49 and enlarged opening 55 of said bore. From the opening 55, the fluid flows through the outlet 56 into the passage 57 and then passes through the coupling 58 and through the gooseneck coupling 14 for discharge into the conduit 12 and passage 10 and from the latter flows into the hammer cylinder. As before indicated, the pressure is gradually applied to the hammer due to the tapered construction of the valve 50. A certain percentage of fluid flowing into the passage 57 from the outlet 56 will be discharged toward the cylinder 62 to move the same and its rod 61 until said rod is brought into contact with the links 42 and 43 which contact will collapse the links, as illustrated in Fig. 2, thereby pulling the valve upwardly against its seat and shutting off further flow of fluid from the source of supply. Contact of the rod 61 with the links thus terminates the cycle and the operator releases his pressure on the trigger to permit the parts to return to their normal positions under the action of their respective springs.

From the above description when taken in connection with the accompanying drawing, it will be readily apparent that the improved mechanism permits the gradual increase of power on the piston which will be automatically terminated after a predetermined interval of time. The period of the cycle is under the control of the adjustable plug 60 and spring 64. As is understood, the plug 60 is adjusted for increasing or decreasing the tension of the spring 64 and since the cylinder 62 and rod 61 operate against the tension of said spring, speed of movement thereof is controlled by the amount of tension placed on said spring. A needle valve 68 is positioned in the passage 59 for controlling the action of the piston 53. Use of the needle valve 68 to restrict the passage 59 will, of course, delay the action of the piston 53 thereby permitting air under pressure to be more gradually fed to the hammer cylinder and conversely by opening the valve 68 so that an unrestricted passage is provided, the piston will be acted upon at a greater rate of speed and thereby allow the pressure of air to be more rapidly built up in the hammer cylinder before it is terminated by the action of the rod 61 contacting the links 42 and 43 to close the valve 40. The entire operation is automatic since after depressing the trigger, the timer delivers a predetermined time cycle and then stops, thus accurately producing rivet bucktails of uni-

form height and diameter. Use of this improved mechanism insures uniform riveting when several rivets are driven in sequence and avoids the usual re-hitting or over-hitting which frequently requires drilling out and replacement of rivets. In addition, since the riveting cycle is pre-set and ceases automatically when the rivet has been upset, little or no damage to the sheet will be experienced, thus saving not only in rejects but also in material.

Although the foregoing description is necessarily of a detailed character, in order to completely set forth the invention, it is to be understood that the specific terminology is not intended to be restrictive or confining and it is to be further understood that various rearrangements of parts and modifications of structural detail may be resorted to without departing from the scope or spirit of the invention as herein claimed.

We claim:

1. In a mechanism for controlling the operation of a riveting tool or the like, a housing having therein an inlet adapted to be connected with a source of fluid pressure and an outlet, a passage within the housing connecting said inlet and outlet including a valve chamber, a valve in said inlet, manually operable means for opening said inlet valve, a measuring valve in said valve chamber responsive to the pressure of incoming fluid for gradually opening and thereby gradually building up fluid pressure in said outlet, and means responsive to the final pressure of fluid in said outlet for causing the closing of said inlet valve.

2. In a mechanism for controlling the operation of a riveting tool or the like, a housing having therein an inlet adapted to be connected with a source of fluid pressure and an outlet, a passage within the housing connecting said inlet and outlet including a valve chamber, a valve in said inlet, a bore in said housing, manually operable means in said bore for opening the inlet valve including a linkage for transmitting motion to the latter, a fluid actuated valve in said valve chamber operable to cause a gradual building up of fluid pressure in said outlet, a cylinder in said housing extending at substantially right angles to said bore, said cylinder being connected with said valve chamber to receive pressure fluid therefrom, and a piston operable in said cylinder and engageable with said linkage to flex the same and cause closing of said inlet valve after a predetermined time interval, for building up the pressure to a predetermined maximum.

3. In a mechanism for controlling the operation of a riveting tool or the like, a housing having therein an inlet adapted to be connected with a source of fluid pressure and an outlet, a passage within the housing connecting said inlet and outlet including a valve chamber, a valve in said inlet, a bore in said housing, manually operable means in said bore for opening the inlet valve including a linkage for transmitting motion to the latter, a fluid actuated valve in said valve chamber operable to cause a gradual building up of fluid pressure in said outlet, means for restricting the flow of actuating fluid to said fluid actuated valve, a cylinder in said housing connected with said valve chamber to receive pressure fluid therefrom, and a piston operable in said cylinder and engageable with said linkage to flex the same and cause closing of said inlet valve after a predetermined time interval, for building up the pressure to a predetermined maximum.

PAUL VAN SITTERT.
WILLIAM R. KOVACS.