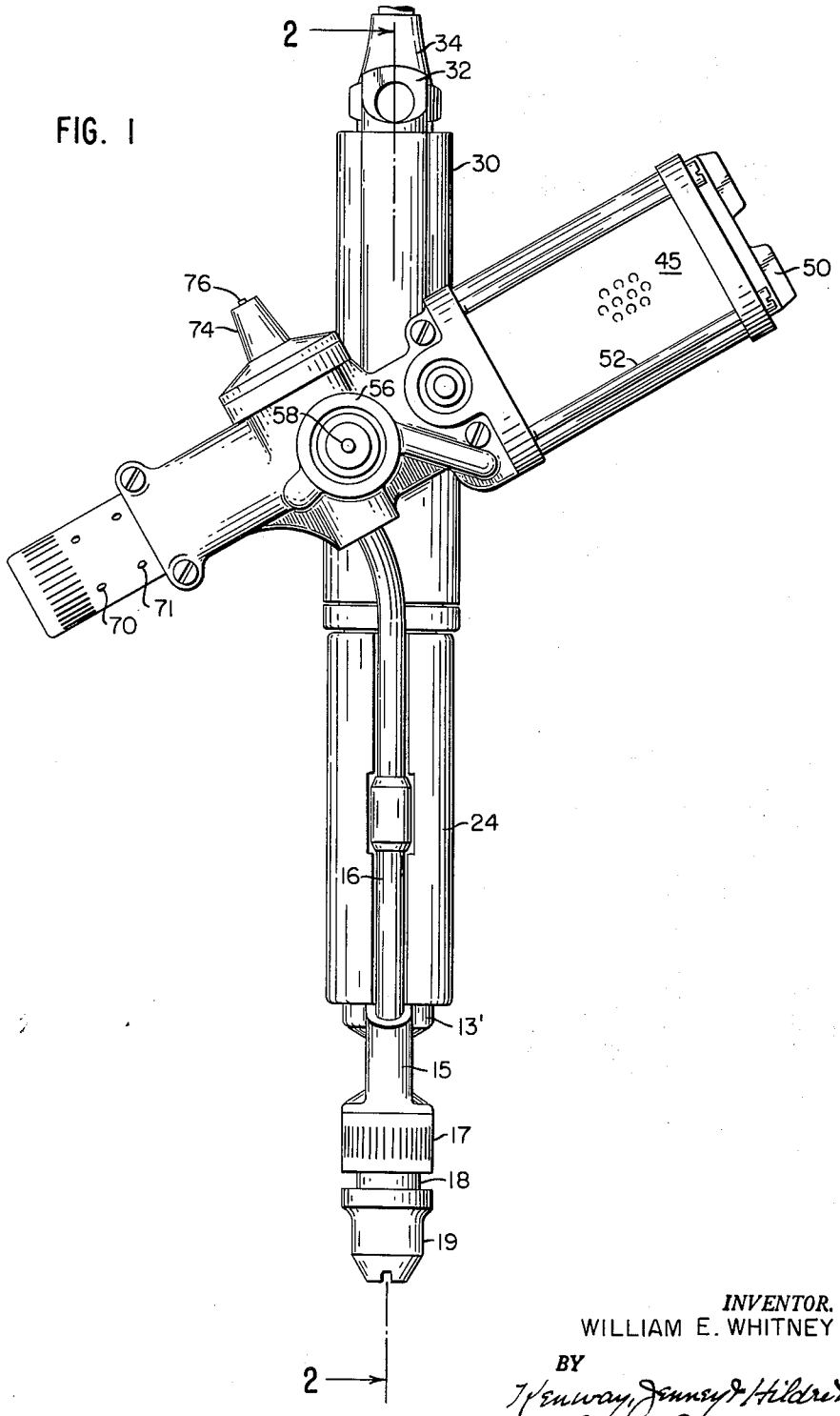
June 4, 1963 W. E. WHITNEY 3,091,768

FLUID OPERATED TACKER

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FIG. 1



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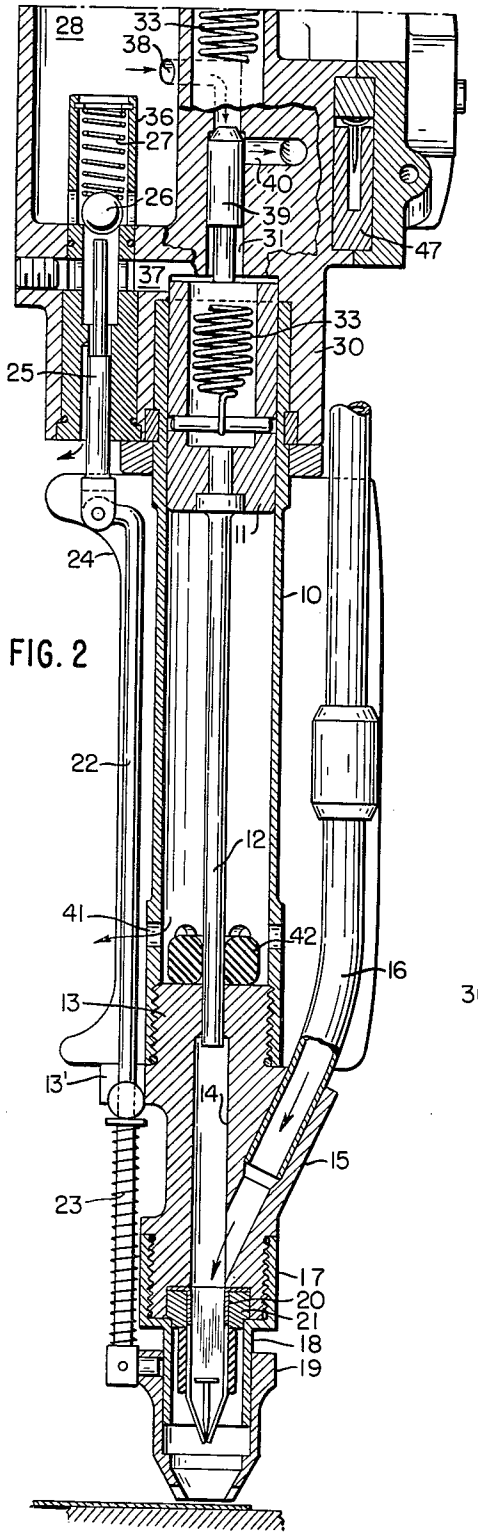


FIG. 2

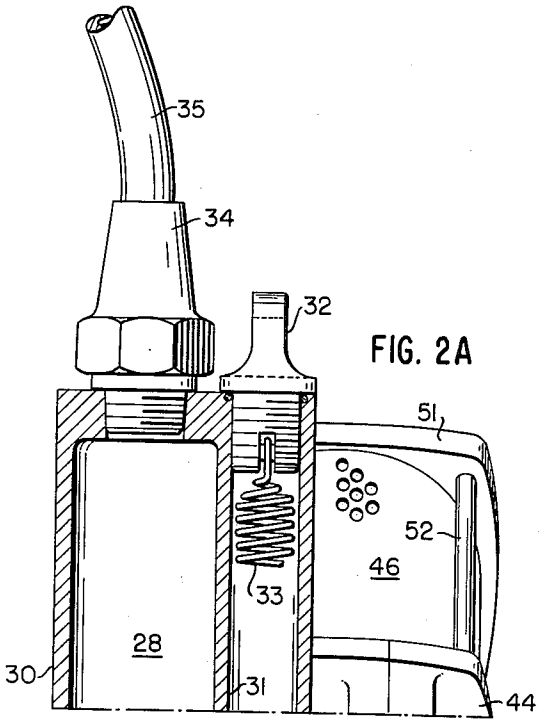


FIG. 2A

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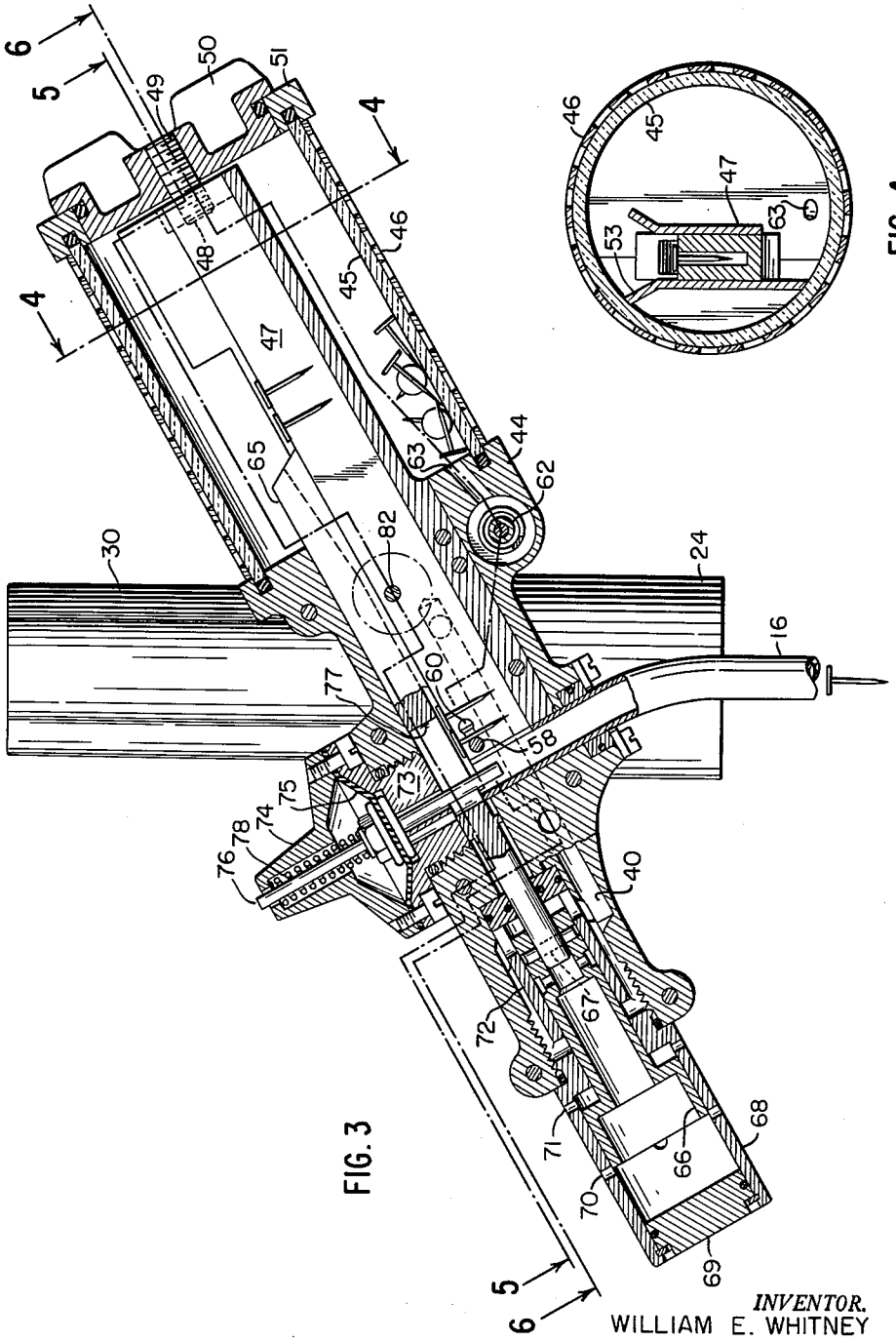


FIG. 3

FIG. 4

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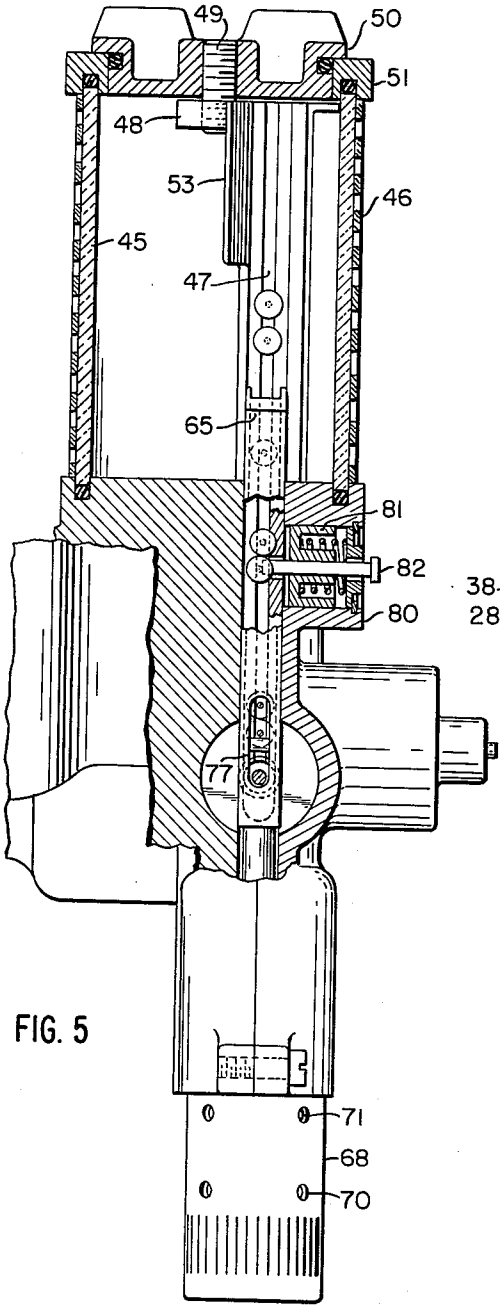


FIG. 5

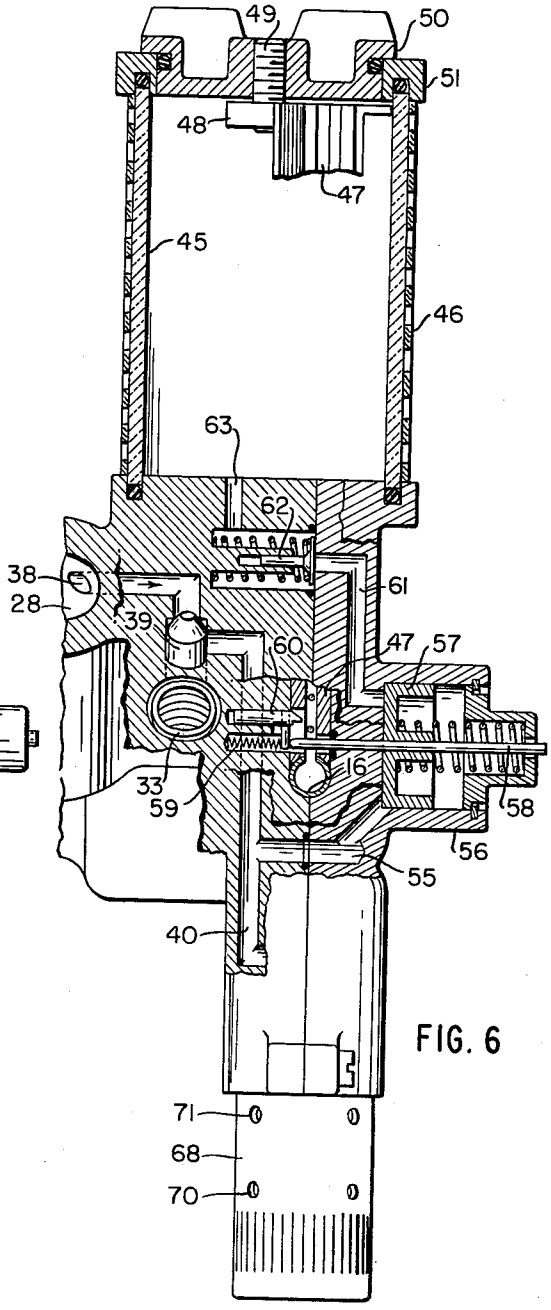


FIG. 6

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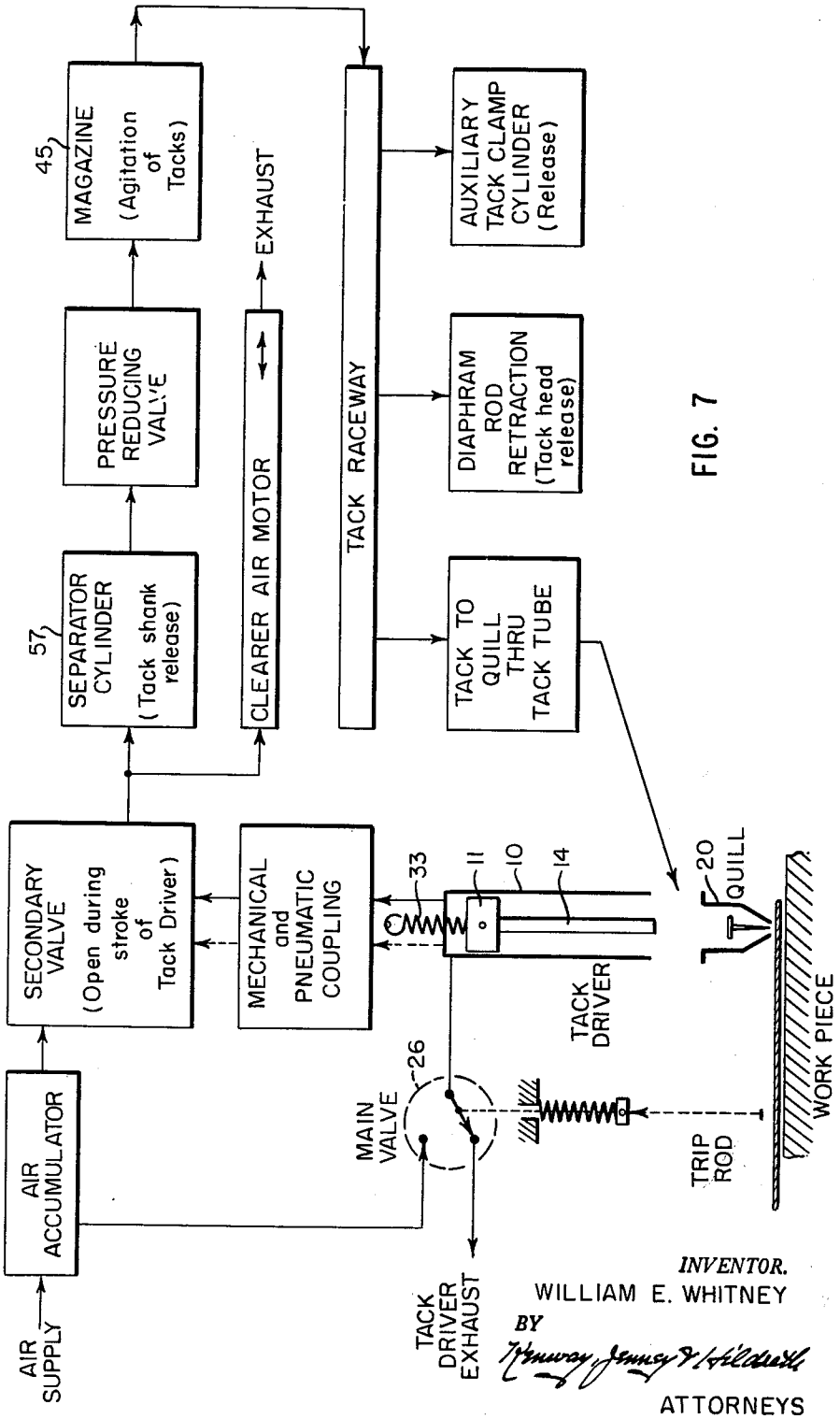


FIG. 7

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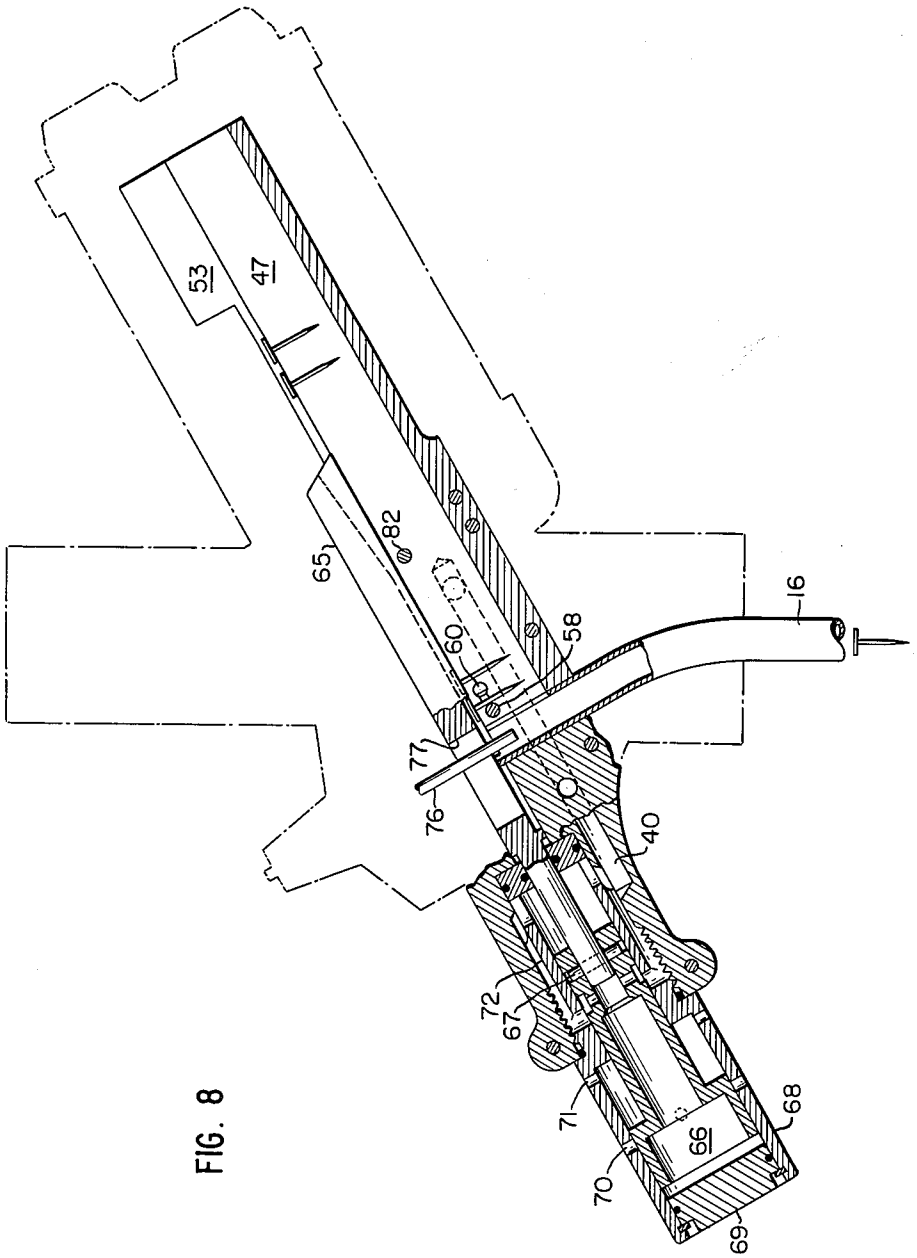


FIG. 8

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United States Patent Office 3,091,768 Patented June 4, 1963

3,091,768
FLUID OPERATED TACKER

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Filed June 16, 1961, Ser. No. 117,662
17 Claims. (Cl. 1—44.4)

This invention comprises a new and improved tacker of the fluid pressure type including in its organization a driver, a tack magazine disposed to hold an ample supply of loose tacks and fluid-operated mechanism for automatically transferring successive tacks from the magazine to driving position in properly timed relation to the action of the driver.

The tacker is characterized by a main valve constructed and arranged to control the admission of compressed air to the driver and a secondary valve operating independently of the main valve for controlling the admission of compressed air to the tack magazine for agitating the tacks therein and causing them to settle themselves properly in the tack raceway. An advantage of this feature is that the driver may be operated by air at a relatively high pressure while other mechanisms, including the magazine, may be operated at controlled lower pressures.

As herein shown the secondary valve is normally held in closed position by the driver piston while the latter occupies its initial position and the valve automatically opened only when the driver has moved away from that position. This arrangement secures a desirable distribution of all available compressed air delivered to the tacker and facilitates the timing of the various auxiliary mechanisms in its organization.

These auxiliary mechanisms are all operated by fluid pressure and include, besides the tack magazine, (1) a tack separator, (2) a tack clearer slide for the raceway, (3) a diaphragm-operated tack escapement and pusher, and (4) a tack clamping and let-off device also associated with the raceway. These various mechanisms cooperate to insure precise and continuous control of the tacks from the magazine to driving position at the nozzle.

Each of the cooperating mechanisms above listed is of novel and improved character as will be pointed out hereinafter and they also constitute a new combination as embodied in the organization of the tacker. Among the advantages they provide a fluid-operated tacker that may be operated at any desired or convenient angle, whereas tackers of this type heretofore available must be held in substantially upright position.

These and other features of the invention will be best understood and appreciated from the following description of a preferred embodiment thereof, selected for purposes of illustration and shown in the accompanying drawings, in which—

FIG. 1 is a view in elevation of the complete tacker,

FIG. 2 is a view in longitudinal section of the lower portion of the tacker,

FIG. 2*a* is a longitudinal section of the upper portion of the tacker,

FIG. 3 is a longitudinal section of the tack assorting and delivering mechanism,

FIG. 4 is a sectional view on the line 4—4 of FIG. 3,

FIGS. 5 and 6 are longitudinal sections taken along lines 5—5 and 6—6 respectively of FIG. 3,

FIG. 7 is a diagram showing the relation of the various steps in the cycle of the tacker, and

FIG. 8 is a fragmentary view of the tack clearer and its operating cylinder.

The complete tacker as shown in FIG. 1 is disposed with its cylindrical tack driving barrel in vertical position. This portion of the tacker is shown in section on a larger scale in FIGS. 2 and 2*a*. The tack assorting and delivering portion of the tacker is also generally cylindrical in contour and intersects the tack driving portion at an angle of approximately 60° as shown in FIG. 1.

The tacker includes a main barrel or cylinder **10** in which reciprocates a piston **11** having a driving rod **12** fast in its lower end and projecting downwardly therefrom. The lower end of the cylinder **10** is closed by a threaded plug **13** having a longitudinal bore **14** in which the driver rod is guided. The plug **13** has a radial flange **13'** on one side which projects outwardly beyond the walls of the barrel **10** and a boss **15** on the other side which is bored to receive the lower end of a tack delivering tube **16** and to direct tacks into the bore **14** of the plug **13** on their way to the quill in which the individual tacks are retained temporarily in driving position.

The lower end of the plug **13** is threaded to receive a knurled cap **17** having a downwardly projecting guide sleeve **18** of reduced diameter. Upon this sleeve is slidingly mounted the nozzle **19**. The quill is formed as a part of a flanged sheet metal sleeve **20** supported by a retaining collar **21** fitted into a recess provided for that purpose in the lower end of the plug **13**. The quill is of the usual construction having its lower end slitted to provide converging spring fingers that normally hold the tack in driving position but permit it to be forced through them by the driving rod **12**.

To one side of the nozzle is pivotally connected the lower end of a long trip rod **22** which passes upwardly through the flange **13'** of the plug and is encircled by a compression spring **23** confined between the flange of the plug and the point of connection between the rod and the nozzle **19**. The spring **23** acts to maintain the nozzle **19** outwardly or downwardly projected as seen in FIG. 2. When the tacker is pressed against the work as suggested in this figure the nozzle yields upwardly sliding on the guide sleeve **18** until arrested by contact with the end of the cap **17**. The barrel **10** is surrounded by a tubular handle **24** of wood or like material. The handle rests at its lower end upon the flange **13'** and is fixed between it and the housing **30** at the upper end of the tool, thus providing convenient means for manipulating the tacker and for pressing its nozzle against the work. At its upper end the trip rod **22** is pivotally connected to a shouldered operating pin **25** for the main valve and this pin is arranged to extend upwardly and engage a ball **26** held downwardly by a compression spring **27** in position to close upon a valve seat formed in the bottom of an accumulator chamber **28** provided in the housing **30** of the tacker. The barrel **10** extends at its upper end into this housing.

In the housing **30** and in alignment with the barrel **10** is formed a tubular spring chamber **31**, closed at its upper end by a threaded plug **32**, which is located at a substantial distance beyond the upper end of the barrel. An elongated spring **33** is secured at its upper end to the plug **32** and at its lower end to a cross pin within the piston **11**, the latter being made hollow to provide additional length for the spring. The function of the spring is to return the piston to its initial position after each working stroke and hold it yielding in readiness to make a driving stroke when actuated by fluid pressure. The provision of the external spring chamber **31** permits the employment of a spring **33** which is longer than the length of the barrel **10** and so subjected to reduced working stress.

The housing **30** is drilled and tapped at the upper end of the accumulator chamber **28** to receive a nipple **34** that supplies connection for the compressed air tube **35**. A tubular valve cage **36** projects upwardly from the bottom of this chamber and encloses the valve seat normally

closed by the ball 26. The main valve controls air flow through a transverse air passage 37 which leads to the upper end of the cylinder 10 above the piston. Accordingly when the nozzle 19 is depressed and the ball 26 lifted air under full pressure is admitted to flow past the reduced stem of the pin 25 and to the passage 37 whereupon the piston makes its working stroke against the tension of the spring 33. During this stroke air contained within the barrel 10 is vented through the ports 41 in the lower end of the barrel while the piston is arrested at the end of its stroke by an annular cushion bumper 42 which rests upon the upper end of the plug 13.

The housing 30 contains a vertical air passage 31 which is offset rearwardly with respect to the axis of the barrel 10 and in direct communication with the accumulator through a second air passage 38. The passage 31 contains a cylindrical valve 39 normally closing a connected air passage 40 which leads to the tack magazine. This secondary valve is normally held closed by the piston 11, the lower end of the valve 39 resting upon the rim of the piston which is farthest from the observer as seen in FIG. 2. When a working stroke is imparted to the piston 11 the secondary valve 39 is open long enough to admit a puff of air to the tack magazine and this puff is continued while the piston is making its full stroke and until it is retracted to its initial position and the valve 39 lifted and again closed by the piston. The piston 39 is limited in its downward movement by engagement with the top edge of the cylinder 10 as indicated in dotted lines in FIG. 2.

The housing is shaped to provide a circular seat 44 disposed approximately at an angle of 60° to the axis of the barrel. In the seat is formed a circular groove to receive the inner end of a cylinder 45 of Pyrex glass surrounded by a cylindrical guard 46 of perforated aluminum. These cylindrical members form the tack magazine and in the axis thereof is located the tack raceway 47 secured at its lower end in the seat 44 of the housing, and having at its upper end an ear 48. The magazine is closed by a cap 50 removably secured in place by a bolt 49 threaded into the ear 48 at the end of the raceway. The cap 50 may be conveniently removed for filling the magazine with loose tacks as suggested in FIG. 3. The cap 50 is surrounded by a ring 51 grooved to receive the outer end of the cylinder 45 and held in place by threaded rods 52 screwed into the seat 44. The upper end of the raceway is provided with diverging deflecting plates 53. When a puff of air is introduced into the magazine the loose tacks are agitated and thrown upwardly. Certain of the tacks are deflected and fall into the raceway, being supported by their heads in position to slide downwardly thereon.

The air passage 40, which is controlled by the secondary valve 39, is shown in FIG. 6 as leading through a connected air passage 55 to a valve chamber 56 formed in the housing. Within this chamber is a circular spring-pressed piston or valve 57 fast to a pin 58 which passes inwardly into the housing and constitutes one element of an escapement mechanism for separating the shanks of the tacks as they pass downwardly on the raceway. The pin 58 itself crosses the raceway in position to stop the foremost tack therein and engages the transverse pin of a plunger 60 which is undercut and beveled at its end to pass between the first and second tacks in the raceway. A compression spring 59 bears upon the cross pin opposite the end of the valve pin 58. In FIG. 6 the raceway is shown as leading downwardly to the upper end of the tack tube 16 where the tube enters the housing 30 and the valve pin 58 is shown in position to prevent the endmost tack from entering the tube 16. However, when a puff of air is released by opening the secondary valve 39 the separator valve 57 is depressed and opened, the valve pin 58 is withdrawn releasing the endmost tack and the bevel plunger 60 is advanced temporarily to arrest the next tack in the raceway.

When the separator valve 57 is opened compressed air from the passage 55 is permitted to flow through the valve chamber 56 and on through a passage 61 in the housing which leads into the base of the magazine through an inlet passage 63. Included between the passages 61 and 63 is a reducing valve 62 acting to insure that air is introduced into the magazine at a pressure reduced as compared to that admitted to the driver cylinder 10. It has been found that the full operating pressure is not required for agitating the tacks and in fact is likely to cause too great disturbance in the magazine.

The raceway 47 is provided with a tack clearer slide 65 undercut on a bevel at its forward end as shown in FIG. 3 so as to clear the heads of tacks in the raceway while removing those improperly positioned. The slide is elongated and secured to a shouldered hollow piston 66 by a cross pin 67. The piston is arranged to reciprocate in a cylinder 68 threaded at its inner end and screwed into the bore of the housing. The outer end of the cylinder is closed by a plug 69 and the cylinder is provided with vents 70 and 71 at different points in its length. The inner or reduced end of the piston 66 is received within a bushing 72 provided with air passages leading from the longitudinal passage 40 already mentioned. When a puff of air is admitted by the secondary valve 39 compressed air passes to the inner end of the piston 66 moving it outwardly while air in the cylinder is exhausted through the vent 70. When outward movement of the piston closes this vent compressed air passing through the cylinder builds up pressure in the outer end of the cylinder and moves the piston inwardly exhausting air through the vent 71. The result is that with each puff of air the clearing slide 65 makes several quick reciprocations thus clearing the raceway at its tack receiving end of all improperly located tacks.

The housing is drilled and tapped at its upper side to receive a threaded plug 73 and this together with an external conical housing 74 form a chamber for a flexible diaphragm 75. The diaphragm is connected to a rod 76 which is arranged to reciprocate through a slot 77 in the clearer slide 65 and pass into the raceway at the upper end of the tack tube 16. The function of the diaphragm rod 76 is to engage the head of each tack as it is released by the escapement rod 58 and hold it until its point has been moved into the tack tube. The diaphragm is held in its lowermost position as shown in FIG. 3 by a compression spring 78 and is elevated by air pressure transmitted from the tack magazine through the raceway to a transverse passage concentric with the inner portion of the diaphragm rod 76. When the rod 76 is moved downwardly it engages the tack just released and pushes it down into the end of the tack tube 16.

The housing is also provided with a valve casing 80 adjacent to the inner end of the tack magazine as shown in FIG. 5. In this casing is provided a circular valve 81 fast to a clamping pin 82 which is arranged at its inner end to pass through one side of the raceway and clamp a tack temporarily in stationary position therein. The raceway is perforated to provide an air passage concentric with the clamping pin 82 so that with each puff of air delivered to the magazine the valve 81 with the clamping pin 82 is momentarily retracted and a tack permitted to continue its progress along the raceway to the escapement plunger 60. The purpose of this tack clamping device is to relieve the escapement plunger 60 of the pressure of an extended row of tacks in the raceway and to avoid jamming.

The various operations carried out in the normal cycle of the tacker are diametrically shown in FIG. 7. Air under pressure of 70 to 110 p.s.i. may be supplied to the accumulator from which it is admitted to the driving cylinder 10 by action of the trip rod on the main valve 26. Movement of the piston 11 results in opening the secondary valve 39 admitting compressed air first to the separator valve 57 then, via the reducing valve 62, to

the magazine **45** for agitating the tacks in the magazine. Air flow to the magazine continues during the full driving and return stroke of the piston **11**. Simultaneously compressed air passes to the cylinder **68** of the air motor which operates the clearer. Compressed air passes from the tack magazine via the raceway down through the tack tube **16** and escapes at the quill **20**, thus assisting the feeding movement of the tacks throughout their whole course in the tacker. It also passes to the diaphragm chamber operating the rod **76** to release and then advance a tack into the tack tube. It also passes through the raceway to the valve casing **80** where it is effective to release momentarily the tack clamping pin **82**. Meantime the tack which has been delivered to the quill is driven into the work and the piston **11** returns under actuation of the spring **33** to its initial position closing the secondary valve. The clamping pin **82** releases a tack while the piston is going down so that the released tack arrives at the lower end of the tack tube just after the actual driving operation and is admitted to the quill as soon as the driver has lifted enough to unblock the end of the tube **16**. During the retraction of the driver the full fluid pressure of the service line is built up in the accumulator in readiness for the next shot. It will be understood that the cycle of the tacker has the advantage of conserving the compressed air required for its operation.

The invention has been described as embodied in a tacker useful for driving upholstery or carpet tacks, or in the shoemaking industry for driving insole or lasting tacks. It will be apparent however that with slight modification it may be adapted for assorting and driving any suitable headed fastener and such application is within the scope of the invention.

Having thus disclosed my invention and described in detail an illustrative embodiment thereof, I claim as new and desire to secure by Letters Patent—

1. A tacker of the fluid pressure type having a housing, a barrel projecting therefrom, a hollow piston movable in the barrel, an elongated spring chamber formed in the housing in alignment with and outside the barrel, and a spring of greater length than the barrel secured at one end in said chamber and at the other within the hollow of the piston for retracting the piston and holding it normally in its initial position in the barrel.

2. A tacker of the fluid pressure type comprising a housing, a barrel projecting therefrom and a piston movable in the barrel, an accumulator chamber in the housing, a valve-controlled air passage in the housing extending from the accumulator chamber to the barrel, a tack magazine mounted on the housing, an air passage in the housing extending from the accumulator chamber to the magazine, and a secondary valve in the latter passage held closed by the piston when in its initial position in the barrel.

3. A tacker of the fluid pressure type as described in claim 2, further characterized in that the piston is maintained by a spring in its initial position and in that position the piston directly engages and maintains in closed position the secondary valve controlling flow of air to the tack magazine.

4. A tacker of the fluid pressure type as described in claim 2, further characterized in that a pressure reducing valve is included in the air passage between the accumulator chamber and the tack magazine.

5. A tacker of the fluid pressure type as described in claim 2, further characterized in that a fluid-operated tack separator is included in the air passage between the accumulator chamber and the tack magazine.

6. A tacker of the fluid pressure type having a barrel, a reciprocating piston therein and an air-operated tack magazine, air connections including a main valve for controlling flow of compressed air to the piston, and air connections including a secondary valve normally closed by the piston and released by the piston to admit compressed air to said magazine throughout each full stroke of the piston.

7. A tacker of the fluid pressure type comprising a fluid pressure cylinder having a piston therein, air connections including a main valve for admitting compressed air to the cylinder, an air-operated tack magazine, air connections including a secondary valve closed by the piston, in combination with a tack raceway having a tack separator operated by compressed air on its way to the tack magazine after release by said secondary valve by movement of the piston from its initial position.

8. A tacker of the fluid pressure type comprising a housing having an accumulator, a cylinder for a piston and an air-operated driver, an air-operated tack magazine containing a tack raceway, a main valve between the accumulator and the driver cylinder, a separate air passage between the accumulator and the tack magazine controlled by a secondary valve which is held in closed position by said piston, a fluid-operated tack separator in connection with said air passage, and a fluid-operated clearer slide also in connection with said air passage, both the tack separator and the clearer slide being timed in their operation by said secondary valve when it is released by said piston.

9. In a tacker of the fluid pressure type, a tack magazine having a raceway therein, a fluid-operated motor, a clearer slide reciprocated by said motor upon the raceway and having an elongated slot therein, a tack tube opening beneath said slot, and a diaphragm-operated rod reciprocated through the slot in one direction to release a tack in the raceway and in the other direction to push the tack toward the said tube.

10. In a tacker of the fluid pressure type, a housing having a driver-operating cylinder, a tack magazine having a raceway therein, an air-valve in the housing, and tack separating mechanism operated thereby including a rod arranged to arrest the endmost tack of the raceway, and a connected plunger movable with said rod to arrest the second tack of the raceway, and air passages in the housing between the tack magazine and said air valve, together with an air-operated clamping device associated with the raceway for restricting the row of tacks in the raceway to safeguard the separating mechanism against pressure of an extended line of tacks in the raceway.

11. In a tacker of the fluid pressure type, a housing presenting a circular seat, a transparent cylinder seated therein and containing an axially disposed raceway, a closing cap removably secured to the end of the raceway, a grooved ring surrounding said cap and fitting the outer end of said cylinder, and threaded rods securing the ring to the housing independently of said closing cap.

12. A tacker of the fluid pressure type, comprising a reciprocatory driver, a magazine for loose tacks having a grooved raceway therein, fluid pressure connections for agitating tacks in the magazine and causing them to fall on the raceway, a tack-clearer slide arranged to reciprocate upon the sides of the raceway and having one end undercut on a bevel above the groove of the raceway in order to clear the heads of tacks properly located thereon, an air-operated motor connected to the other end of said slide, a valve controlled by the driver for timing the operation of said motor, and a tack tube extending from the raceway to the path of the driver.

13. A tacker of the fluid pressure type as defined in claim 12, further characterized in that the tack-clearer slide is slotted in registration with and above the receiving end of the tack tube, and a fluid-operated tack pusher is arranged to reciprocate through the slot of the slide in alignment with the tack tube while the slide is in motion.

14. A fluid operated tacker comprising an accumulator chamber for compressed air at full service pressure, a driver operating cylinder containing a piston and having direct valve-controlled connections with the accumulator chamber, a tack magazine for assorting loose tacks and dispatching them to driving position, and means for di-

recting an air blast to agitate tacks in the magazine including a separate valve-controlled passage from the accumulator containing a secondary shut-off valve and a reducing valve whereby its magazine may be operated at reduced air pressure as compared with that of the driver operating cylinder and piston.

15. A fluid operated tacker comprising a magazine for loose tacks containing an inclined raceway, a tack tube opening beneath the raceway, means for supplying a tack-agitating blast of compressed air to the magazine for throwing tacks upon the raceway and following the tacks down the raceway for delivery to the tack tube, and an intermittently reciprocating member for engaging the head of each tack traveling on the raceway and retarding the tack until its point registers with the tack tube.

16. A tacker of the fluid pressure type comprising an accumulator, a cylinder having direct valved connection therewith, a driving piston arranged to reciprocate in said cylinder, a magazine having independent connection with

the accumulator and a secondary valve therein which projects into the path of said piston and is held closed by the piston in its initial position, whereby the said valve is timed to open and remain open thus admitting fluid pressure to the magazine during the full driving and return strokes of the piston.

17. A tacker of the fluid pressure type as described in claim 16, further characterized in that the said secondary valve is moved to open position by fluid pressure from the accumulator when released by said piston.

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