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E. S. MOORE

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POWER OPERATED SCREWDRIVER WITH SCREW DELIVERING MEANS

Filed Sept. 4, 1952

4 Sheets-Sheet 1

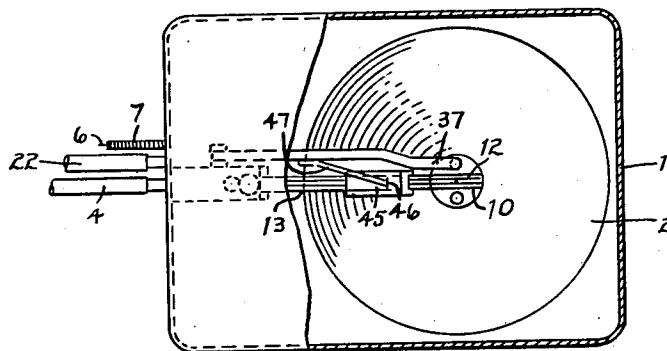


FIG. 1.

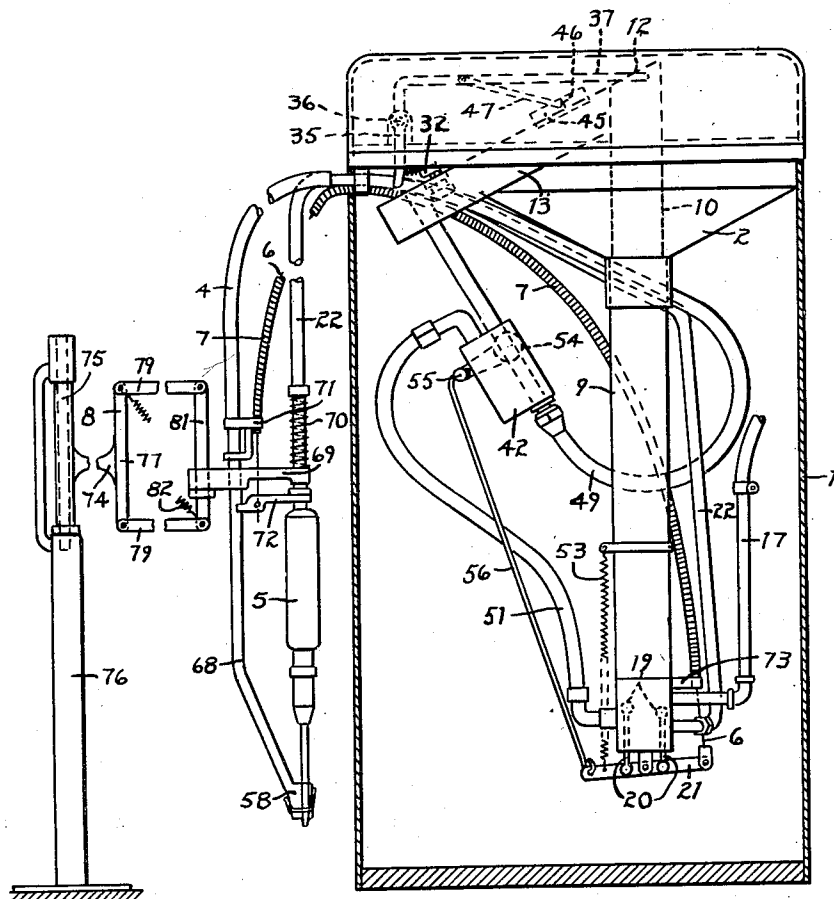


FIG. 2.

INVENTOR

Edgar S. Moore

by

Douglas S. Johnson

ATTY.

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E. S. MOORE

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4 Sheets-Sheet 2

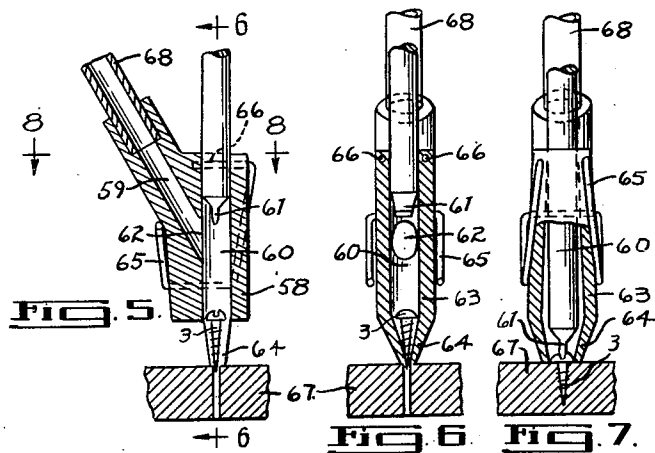
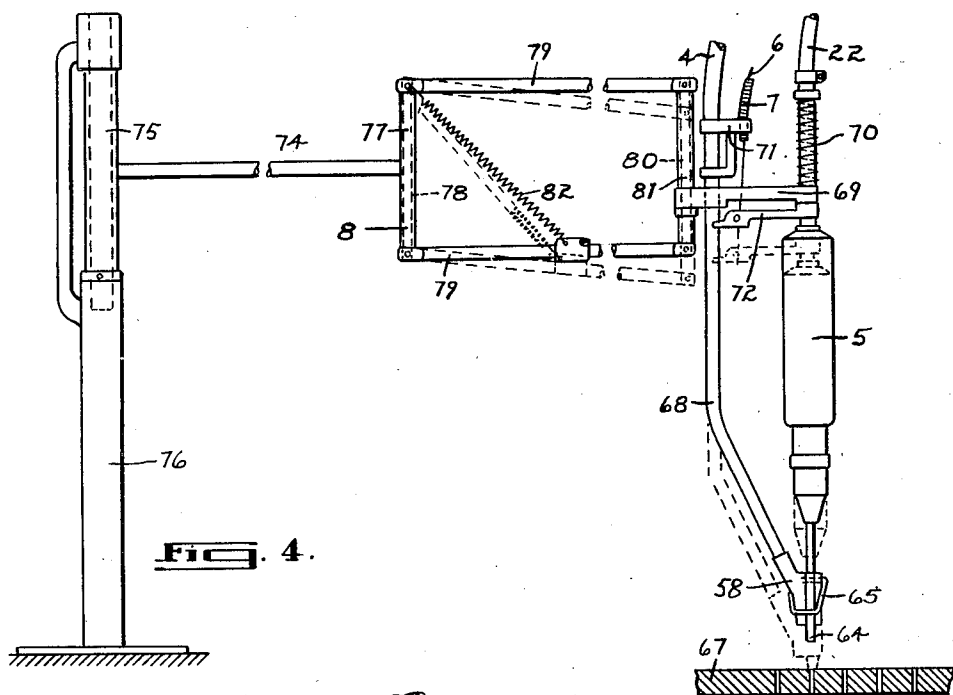
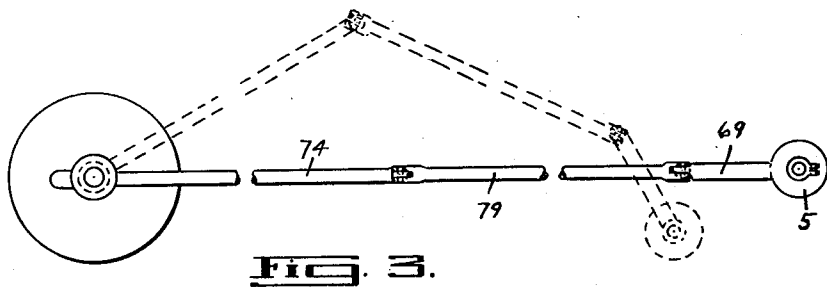


FIG. 8.

INVENTOR
Edgar S. Moore

Douglas S. Johnson

ATTY.

April 19, 1955

E. S. MOORE

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4 Sheets-Sheet 3

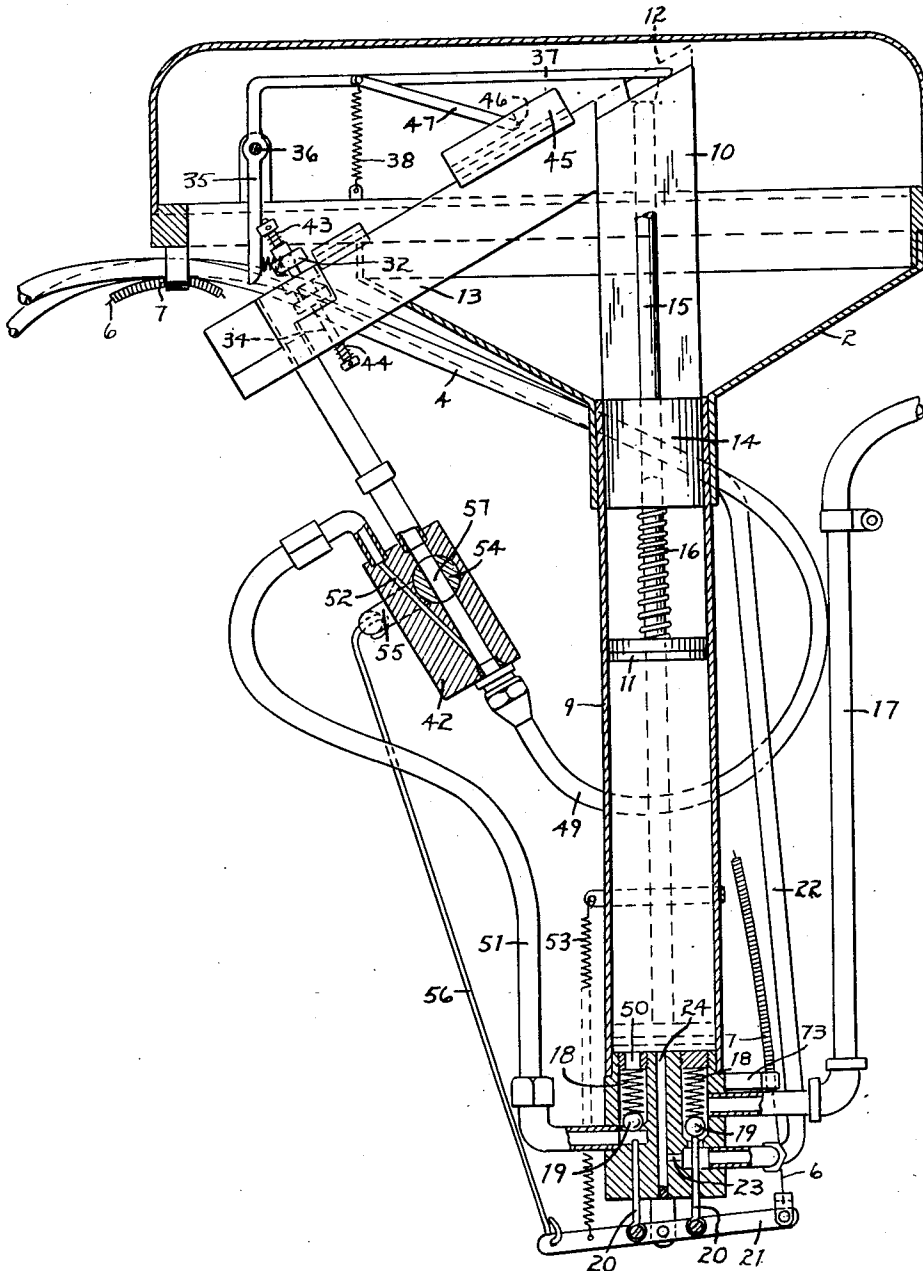


FIG 9.

INVENTOR

Edgar S. Moore

Douglas S. Johnson

ATTY.

April 19, 1955

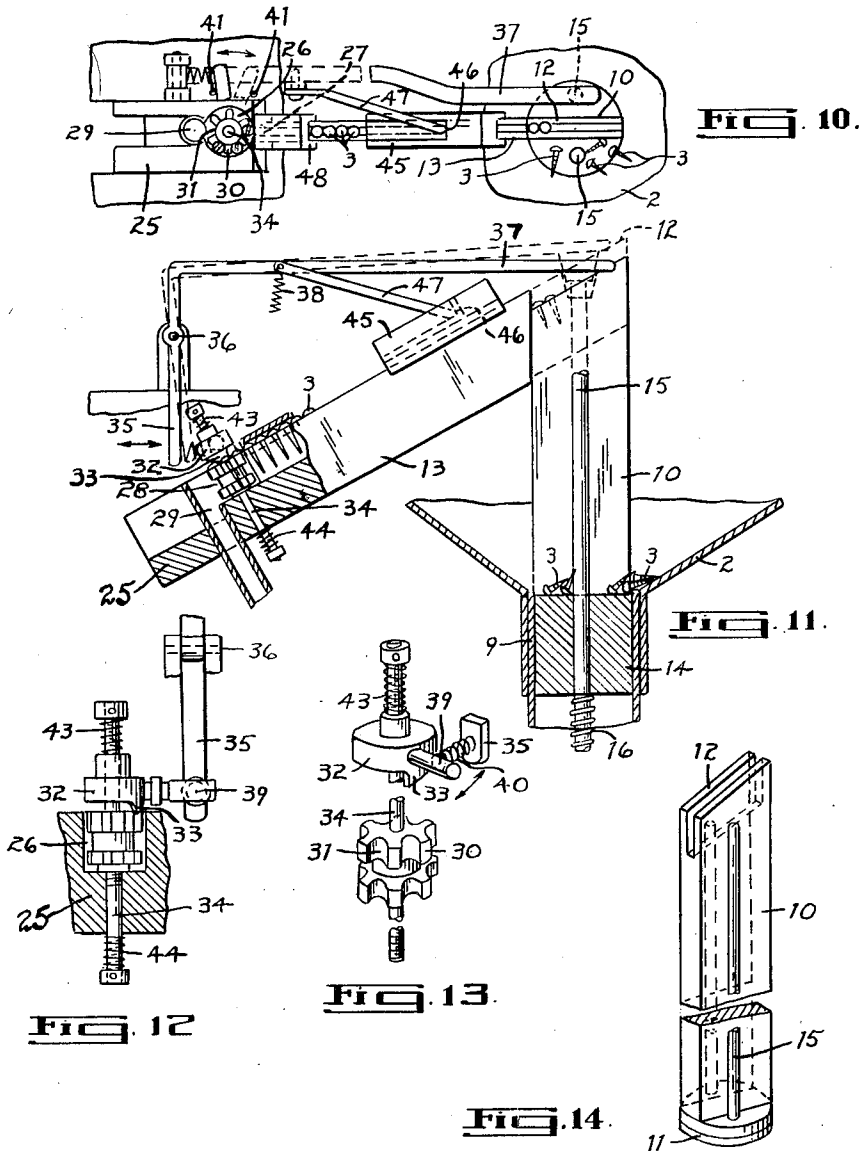
E. S. MOORE

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POWER OPERATED SCREWDRIVER WITH SCREW DELIVERING MEANS

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4 Sheets-Sheet 4



INVENTOR

Edgar S. Moore

By Douglas S. Johnson

ATTY.

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POWER OPERATED SCREWDRIVER WITH SCREW DELIVERING MEANS

Edgar S. Moore, Toronto, Ontario, Canada, assignor of one-third to Frank Manton, one-third to James T. Manton, and one-third to Douglas H. Manton, all of Etobicoke, Ontario, Canada

Application September 4, 1952, Serial No. 307,787

19 Claims. (Cl. 144—32)

This invention relates to improvements in means for feeding screws or the like to the working point of a driving tool.

The principal object of the invention is to enable screws, tacks, escutcheon pins and other types of fasteners to be automatically served individually to the tool ready for driving regardless of the rapidity with which it is desired to drive successive fastener elements.

A further important object is to provide a dependable server which will eliminate jamming of the screws or fasteners being fed and will synchronize the rate of feed exactly to the tool requirement regardless of the speed at which the tool is operated.

Still a further object is to provide a server which will be relatively simple yet foolproof and will serve the fastener elements to remote positions in an economical efficient manner.

Another important object is to ensure the screw or fastener fed to the tool is properly supported in advance thereof ready for driving.

Still another important object is to enable the tool to be accurately guided to and from the work piece yet freely maneuverable over the surface of the work.

One of the principal features of the invention resides in providing, in conjunction with mechanism to deliver screws or other fasteners individually from a supply stock to a delivery tube, a compressed air drive to chase the screws or fasteners through the tube to the working point of the tool, the timing being controlled by a positive Bowden cable connection so that a screw is delivered to the working point by the lifting motion of the tool off the preceding fastener following its driving.

Another important feature resides in incorporating a compressed air-operated device in the mechanism feeding the screws or fasteners from a stock or supply, and utilizing the exhaust from such device to chase the screws through the delivery tube to provide an air economical apparatus, using only a definite material volume of air.

Still another feature resides in delivering the screws or the like down an inclined track to a rotor valve positioned in advance of the mouth of the delivery tube, the rotor valve being formed to carry screws individually from the track and deposit them in said tube in position to be chased.

A further feature resides in providing a jam eliminating device in the form of a scavenger member reciprocating above the track to clean off improperly oriented fastener elements lying crosswise of or haphazardly on the track.

Still a further feature resides in providing a resilient expansion tip at the end of the delivery tube to firmly catch and hold the delivered fastener elements in correct position relative the tool for driving but expanding to release the fastener under driving by the tool.

Again an important feature resides in supporting the tool on a pivotal parallelogram support constraining the tool to vertical driving movement but permitting free movement of the tool to any position over the work surface.

These and other objects and features will become apparent from the following detailed description taken in conjunction with the accompanying drawings in which:

Figure 1 is a plan view partly broken away of a portion of the apparatus.

Figure 2 is a part elevational part vertical sectional view of the apparatus.

Figure 3 is a plan view of the tool support.

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Figure 4 is a vertical elevational view of the tool support illustrating the tool movement towards a work piece.

Figure 5 is an enlarged vertical sectional detail of the terminal of the delivery tube illustrating a screw mounted in advance of a driving tool ready to be driven to a piece of work.

Figure 6 is a vertical section at right angles to Figure 5 taken on the line 6—6 of Figure 5.

Figure 7 is a vertical section similar to Figure 6 but showing the screw driven home and the delivery tube tip expanded to permit the advance of the screw.

Figure 8 is a horizontal vertical section on the line 8—8 of Figure 5.

Figure 9 is an enlarged vertical sectional detail of the mechanism and the portion of the apparatus shown in Figure 1 for delivering screws from the supply hopper to the delivery tube and for chasing them through the delivery tube.

Figure 10 is an enlarged plan view of the screw delivery track and elevator.

Figure 11 is an enlarged part-elevational part-vertical sectional view of the elevator and track.

Figure 12 is a part-elevational part-vertical sectional view detailing the rotor valve delivering screws from the track to the delivery tube.

Figure 13 is an exploded view showing the rotary valve and the racking mechanism in perspective.

Figure 14 is a perspective view of the elevator.

Referring first to Figures 1 and 2, the apparatus comprises a unit 1 in the form of a container having a hopper 2 to receive a supply or stock of screws or other fastening elements 3 (Figures 10 and 11).

Within the unit 1 is included mechanism for delivering the fasteners 3 to be served from the hopper 2 to a delivery tube 4 and also a compressed air circuit to chase the fasteners through the delivery tube to the working point of a tool 5, herein shown as a pneumatic driver for driving screws 3.

Connected between the tool 5 and the mechanism within the unit 1 is the wire 6 of a Bowden cable 7 to time the operation of the mechanism of unit 1 with movement of the tool 5, as hereinafter described. The tool 5 is carried from a parallelogram support arrangement indicated at 8 to guide the tool 5 in vertical motion as it is operating to drive the screws or other fastening means 3, as hereinafter described.

Track and elevator mechanism

Referring to Figures 2 and 9 to 11, it will be seen that depending from the hopper 2 is a cylinder 9 in which operates an elevator 10 having a piston end 11. The elevator 10 is in the form of a flat bar having a bevelled or inclined and slotted upper end 12. As shown, this piston, when moved upwardly, is adapted to have its upper end 12 align with a vertically slotted track 13.

The piston operates through a closure 14 sealing the cylinder 9 and is formed at each side with a rod-like extension 15 also operating through the member 14, and each of these rods is encircled by a spring 16 which acts against the piston head 11 to depress the elevator.

The elevator is air-operated and compressed air from an air supply 17 is led in through a valve mechanism generally designated at 18 to the bottom of the cylinder. The valve mechanism 18 contains a pair of spring-loaded ball valves 19 which are operated by plungers 20 controlled by the rocking of a lever 21 connected at one end to the wire 6 of the Bowden cable 7.

When the lever is positioned, as shown in Figure 9 to raise the right-hand ball valve 19 from its seat, compressed air from the supply 17 is introduced into the tube 22 to supply air to drive the tool 5. Air also is introduced through an orifice 23 to a central bore 24 in the valve mechanism 18 which opens to the interior of the cylinder 9, elevating the elevator against the action of the springs 16. It will be noted that the left-hand ball valve 19 remains closed, not only under spring pressure but pressure of the compressed air cylinder 9.

As the elevator is operated upwardly it moves through screws piled in haphazard fashion in the hopper 2 and some screws will orient themselves so that their points

enter the groove of the upper end 12 of the elevator with their heads resting on the tops of the walls of the groove, that is, the upper end 12. By the time the screws begin to slide down the incline of the surface 12 the track 13 blocks the further movement, as shown in Figure 11, but as soon as the elevator reaches the position where its upper edge 12 is in alignment with the upper edge of the track 13 the screws may then freely pass down the registering grooves of the elevator and track members.

Track delivery mechanism

The mechanism for delivering the screws or fasteners 3 individually to the delivery tube 4 is illustrated particularly in Figures 10 to 13. This mechanism comprises a block 25 carried by and aligned with the lower end of the track 13. The block is formed with a circular well 26 surrounded by a peripheral wall having an opening 27 aligned with the slot of the trackway 13, and an opening 28 in diametral relation opening to the entrance 29 of the delivery tube 4 brought up through the block 25.

Mounted in the well 26 is a rotor 30 which has a series of notches 31 around its periphery to receive screws 3. The heads of the screws are supported from the upper surface of the rotor and the block 25, preventing dropping of the screws from the rotor until the screw arrives at the delivery tube entrance 29.

The means for operating rotor 30 comprises a pawl or ratchet device 32 having a cam projection 33 to enter the notches 31 of the rotor. The pawl 32 is rotatably mounted on a shaft 34 and is located to enter the notches 31 of the rotor at the side opposite to the side carrying the screws from the track 13 to the delivery tube. Movement of the pawl 32 to rack the rotor is effected by a lever 35 pivoted at 36 and having a substantially horizontal arm 37, the end of which is adapted to be engaged by one of the rods 15 by movement of the elevator 10 to its elevated position whereby the lever 35 is rocked against the action of the return spring 38 each time the elevator is operated upwardly.

Connecting from an arm 39 on the pawl 32 to the lower end of the lever 35 is a spring 40 which transmits the lever motion to the pawl while allowing relative movement therebetween as the pawl reaches its limit positions as determined by the stops 41 engaged by the arm 39. The connections are such that as the elevator is raised and lever 35 rocked spring 40 will operate the pawl arm 37 to its right-hand dotted position, as shown in Figure 10, and the cam projection 33 entering the notches of the rotor 30 will rack the rotor a sixth of a turn to advance a screw to the delivery tube entrance 29 where it will drop under its own weight through the block 42, Figure 9, into the loop of the delivery tube below this block at the same time a new screw enters the rotor from the track through opening 27.

On return of the elevator 10 downwardly spring 40 returns the pawl through one sixth of a turn until its arm 39 moves to its solid line showing of Figure 10 against stop 41. The cam formation of the pawl projection 33 will ride the pawl upwardly against spring 43 over the rotor portion between adjoining notches 31 and the pawl projection 33 will then enter the subsequent notch.

A spring 44 mounted on the shaft 34 draws the rotor 30 downwardly into firm frictional engagement with the bottom of the well 26 to prevent rotor movement under return movement of the pawl 32.

Screw scavenger

The screws or fasteners picked up from the mat of screws in the hopper 2 may, in some instances, be lying cross-wise on the upper end of the elevator 10 instead of properly falling into the desired position of Figure 11. Such screws may cause jamming of the mechanism delivering the screws down the track 13 to the delivery tube.

To overcome this difficulty a block 45 having a channelled undersurface is slidably mounted on the upper edge of the track 13. Extending between the lever 35 and the stop 46, provided in the upper surface of the block 45, is a push rod 47. This push rod transmits rocking movement of lever 35 to block 45, sliding the block upwardly on depression of the lever arm 37 under action of the spring 38 when the elevator is lowered and allowing the block 45 to slide downwardly under its own weight when lever arm 37 is raised by the elevator.

The screws properly aligned in the track 13 slide freely

beneath block 45 but the block sweeps off any screws lying crosswise etc. on the track.

A somewhat similar channel-shaped block 48 is also mounted on the track 13 immediately in advance of the rotor 30 to block any flying screws from jamming the rotor.

Screw chasing

After depositing a screw from the rotor 30 into the loop 49 of the delivery tube below the block 42 upon elevation of the elevator 10, the lever 21 of the valve mechanism 18 upon being rocked into a position opposite to Figure 9 closes off the right-hand ball valve 19, cutting off the inlet flow of compressed air and opening the left-hand ball valve 19. Then compressed air in the cylinder 9 is free to exhaust through port 50 in the valve mechanism and through tube 51 leading to the block 45 and through a bore 52 to the delivery tube to chase a screw previously deposited by the upstroke of the elevator to the working tool 5.

It will be seen that the springs 16 serve to assist a rapid exhaust of the cylinder 9, and it will be seen that the spring 53 acts to urge lever 21 to open the exhaust valve 19.

In certain instances it may be advisable to prevent blow-back of the exhaust from the cylinder up through the entrance 29 of the delivery tube. In this case a rotary valve 54 is introduced into the block 45 and is operated through an arm 55 and rods 56 connecting the arm 55 to the lever 21, as shown in Figure 9. With the lever operated to introduce air into the cylinder 9, valve 54 is rotated so that its bore 57 aligns with the delivery tube passage.

Upon operation of lever 21 under spring 53 to exhaust the cylinder, valve 54 is rotated to cut off blow-back. It will be particularly noted that the exhaust chasing drives the screws with a definite and material volume of air without air wastage.

Delivery head

The screw or fastener chased through the delivery tube 4 is carried to a head at the terminus of the tube, particularly illustrated in Figures 5 to 8. This head is in the form of a block 58 having intersecting passages comprising an angled passage 59, into which the delivery tube 4 discharges, and a vertical passage 60 adapted to receive the working point of element 61 of a working tool 5, with the point normally being held above the entrance 62 of passage 59 into passage 60.

The block 58 is slotted to receive a pair of jaws 63 which constitute one pair of opposing walls of the passage 60, as shown in Figure 6, and these jaws are formed with inturned ends 64 to form a working point projecting below block 58. The jaws 63 are urged together by a spring loop 65 embracing the jaws and having right angularly turned ends 66 on which the jaws are pivoted, so that the spring loop 65 forms both a resilient jaw closer and pivotal support.

The force of the spring loop 65 is sufficient to maintain the jaws 63 closed, as illustrated in Figure 6, against the impact of the screw 3 delivered thereto under pressure of the exhaust air from cylinder 9. However, when the working element 61 of the tool is advanced from the position of Figure 6 to the position of Figure 7 to drive the screw, the jaws are forced apart, permitting the screw to enter and drive into the work piece 67.

Timing and operation

The delivery tube 4 has a rigid end section 68, Figures 2 and 4, connecting to the block 58. A cross brace 69 connects the delivery tube portion 67 and a part on the tool 5 to connect these members while permitting relative movement therebetween to enable the tool to advance from the position of Figure 6 to Figure 7 against the action of spring 70. Fixed to the delivery tube on a bracket 71 is the sheath of the Bowden cable 7, while the wire 6 is connected to an arm 72 carried by the tool, as shown in Figure 4. As shown in Figures 2 and 9, the opposite ends of the cable sheath and wire connect respectively to a fixed arm 73 carried by the cylinder 9 and the lever 21.

The operation of the device is that the tool and delivery tube portion 68 are moved together to the operating position shown in Figure 4, dotted line, without effecting operation of the server.

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Movement of the tool to drive the working element from the position of Figure 6 towards the position of Figure 7 causes relative movement between the tool and tube, exerting a pull through the wire 6 of the Bowden cable to pull the lever 21 to the position of Figure 9. At this instance air is delivered from the air supply 17 through the tube 22 to operate the tool to drive the screw. At the same time air is introduced into the cylinder 9 to elevate screw elevator 10 through the screw hopper 2 to carry and deposit screws in the track 13.

As the elevator reaches the top of its stroke lever 35 is operated to rack rotor 30 its fraction of a turn to drop an individual screw into the loop 49 of the delivery tube.

The scavenger member 45 will slide down the track 13 in its track-clearing movement.

As soon as the screw has been driven a lifting motion of the tool 5, either manually or under action of the spring 70, will again cause relative movement between the tool and delivery tube and this relative movement is transmitted through the Bowden cable to rock the lever 21 in the reverse direction from the position of Figure 9 to cut off the air supply, open the exhaust valve 19 and operate valve 54 through rod 6 to deliver air exhausting from the cylinder 9 to chase the previously deposited screw to the head formed by the block 58.

Thus the screw is being delivered to the head as the tool is lifted clear of the previously driven screw and the tool is ready for immediate subsequent use.

By timing screw feed with the movement of the tool, the screws are fed in exact synchronism with the rate of the tool operation independent of any variation of the speed and independent of the rapidity of successive operations.

Simultaneously with the depression of the elevator 10 lever 35 will be operated downwardly under its return spring 38; scavenger 45 will be operated up the track 13 by push rod 47, clearing off loose or cross-wise screws; and at the same time pawl 32 will be rotated to the successive notch on the rotor, ready for subsequent racking.

It will be appreciated that the elevator 10 may occasionally come up empty-handed but normally two, three or more screws are caught in the slot in the top as it passes through the screw mat, so that the track 13 is continually maintained full.

Tool serving support

As stated, the tool 5 and the tube section 68 are mounted for relative motion only to permit movement of the tool in a direction towards or away from the screw. This direction should, in normal instances, be perpendicular to the work piece 67, and to this end the tool is mounted on the tool-serving device, Figures 3 and 4. This device comprises an arm 74 mounted on a sleeve 75 rotating on a vertical post 76. This arm 74 carries a parallelogram support comprising a left-hand vertical tube 77 in which rotates a post 78 having pivoted to the ends thereof the normally horizontal arms 79, which in turn are pivotally connected at their outer ends by a post 80 within a tube 81 to which the cross brace 69, carrying the tube section 68 and the tool 5, is secured.

As shown in Figure 3, the arm 74 and the parallelogram construction, represented by the arms 79, and the cross brace 69 comprises an articulated structure which permits the tool 5 to be swung at will over the surface of the work piece.

As shown in Figure 4, the parallelogram construction may be depressed against the action of spring 82 to allow the tool to be lowered on the work while maintaining it in a position correctly normal to the work.

It will be understood that various details of constructions and substitution of parts may be made within the spirit of the invention.

What I claim as my invention is:

1. In a screw serving and driving apparatus or the like, a driving tool, a delivery tube terminating in advance of said driving tool, mechanism for delivering screws or the like individually into said tube, compressed air means including a variable volume air storage chamber to chase a screw in said tube into advance of said driving tool, and cable control means operatively associating said tool with said mechanism and said compressed air means and

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actuating said mechanism on movement of said tool driving a screw in advance thereof to deliver a screw to said tube and actuating said compressed air means to deliver air from said variable volume chamber to chase a screw through said tube on lifting of said tool from a driven screw.

2. In a screw serving apparatus or the like comprising, a driving tool, a supply of screws or fastening elements, a delivery tube terminating in advance of said tool, screw delivery means including compressed air operated means affording a variable volume air storage chamber to deliver screws from said supply individually to said delivery tube, and air circuit means to direct air from said variable volume chamber to chase a screw through said delivery tube to a position in advance of said tool, a control operating said screw delivery means to deliver a screw to said tube upon movement of said tool to drive a screw and energizing said air circuit means to chase a screw through said tube on lifting of said tool from a driven screw, said control comprising valve means controlling compressed air flow to said air-operated means and from said variable volume chamber to said delivery tube, and flexible connection means transmitting movement of said tool towards and from a screw fed in advance thereof to said valve means.

3. A device as claimed in claim 2 in which said flexible connection means comprises a Bowden cable having a flexible sheath fixed relative to said tube and a stationary part of said valve means and a flexible wire core connecting said tool and a moving member of said valve means.

4. In an apparatus for serving and driving fasteners or the like, a driving tool, a delivery tube to deliver a fastener to said tool terminating in a head in advance of said tool means connecting said tube and tool for movement of said tool relative to said tube towards and away from a fastener delivered to said head, means including compressed air operated means including an air storage chamber for delivering fasteners individually to said tube, an exhaust system for said air storage chamber communicating with said tube, valve means controlling air flow to said compressed air means and through said exhaust system, and flexible connector means transmitting relative movement of said tube and tool to said valve means to deliver a fastener to said tube upon tool movement to drive a fastener and to exhaust said air storage means to chase a fastener to said head upon lifting of said tool from a driven fastener.

5. In a screw serving apparatus or the like a screw delivery tube, means for feeding screws from a screw stock individually into said tube including compressed air cylinder operated means, an air supply circuit connected with said compressed air cylinder operated means, and an exhaust connection from said compressed air cylinder operated means to said screw delivery tube and valve means for connecting said air supply circuit with said air operated means while closing said exhaust connection to feed a screw into said tube and to cut off said air supply circuit and open said exhaust connection to chase a screw through said delivery tube by cylinder exhaust comprising a definite and material volume of air.

6. In a screw serving apparatus or the like a screw delivery tube, means for feeding screws from a screw stock individually into said tube including compressed air operated mechanism having an air storage chamber, an inlet to said compressed air operated mechanism and an exhaust from said air storage chamber valve means controlling said inlet and said exhaust, and an air connection from said exhaust to said screw delivery tube.

7. In an apparatus for serving and driving screws or the like, a driving tool, a delivery tube to deliver a screw or the like to said tool terminating in a head in advance of said tool, means connecting said tube and tool for movement of said tool relative to said tube towards and away from a screw delivered to said head, means for feeding screws from a screw stock individually into said tube including compressed air operated mechanism, an inlet to said compressed air operated mechanism and an exhaust therefrom, valve means controlling said inlet and exhaust to open and close same, an air connection from said exhaust to said tube to deliver exhaust air to chase a screw delivered to said tube, and flexible connector means transmitting relative movement of said tube and tool to said valve means to open said inlet and close said exhaust to deliver a screw to said tube upon tool movement to drive a screw, and to close said inlet and open said

exhaust to chase a screw to said head upon lifting of said tool from a driven screw.

8. A device as claimed in claim 7 in which said flexible connector comprises a Bowden cable.

9. In apparatus for serving screws or the like, a screw supply, a delivery tube through which screws are adapted to be transmitted to a work piece, means for delivering screws individually to said delivery tube from said screw supply, said means comprising an inclined track longitudinally slotted to receive the body of a screw or the like, an air cylinder operated elevator having an inclined slotted track at its upper end rising through said screw supply into alignment with the aforesaid track to form an inclined screw slide terminating adjacent the entrance to said delivery tube, means for depositing screws from said screw slide individually into said tube, said later means comprising screw selector means adjacent the end of said slide operated by said elevator and means to exhaust the air cylinder of said elevator to chase a screw deposited in said tube.

10. In apparatus for serving screws or the like, a screw supply, a delivery tube through which screws are adapted to be transmitted to a driving tool, means for delivering screws individually to said tube from said supply, said screw delivering means comprising an inclined track terminating adjacent the entrance to said tube and slotted longitudinally to receive the body of a screw with the head supported on the tops of the walls of the slot, an air cylinder below said screw supply, a screw elevator in the form of a piston reciprocated in said cylinder and operable up through said screw supply to deliver screws to said track, the upper end of said elevator being inclined and slotted corresponding to said track and forming a continuation thereof when elevated to define a screw slide to deliver screws towards the entrance of said tube, screw selector means separating screws on said slide and depositing them individually in said tube, means operatively connecting said screw selector means to the movement of said elevator to select a screw once each elevation of said elevator, valve means for controlling air inlet to said cylinder to elevate said elevator, an exhaust connection from said cylinder to said tube, and valve means for controlling exhaust of air from said cylinder to chase a screw deposited in said tube.

11. A device as claimed in claim 10 in which a scavenger member is mounted to slide immediately above said track, and means operating said scavenger member from movement of said screw elevator.

12. A device as claimed in claim 10 in which a bar is mounted to slide on said track, said bar being slotted longitudinally to receive the heads of screws suspended in the slot of said track, and means imparting sliding movement to said bar from movement of said screw elevator.

13. In an apparatus for serving screws or the like to a driving tool for driving into a work piece a support for the driving tool comprising a parallelogram frame mounted to pivot about an axis normal to the work piece on a support structure mounted in turn to pivot about an axis normal to the work piece, said driving tool support comprising four arms forming the sides of the parallelogram and each connected to its adjoining arms by a pivot extending parallel to the surface of the work piece and means for supporting the driving tool from one of said arms to pivot about an axis normal to the work piece.

14. In an apparatus for serving screws or the like to a driving tool for driving into a work piece, an arm mounted to pivot on an axis normal to the work piece, a parallelogram support structure carried by said arm to pivot on an axis normal to the work piece, said parallelogram structure comprising four bars forming the sides of said parallelogram and each pivotally secured to its adjoining bars to pivot on an axis parallel the work piece, one of said parallelogram bars being held normal to the work piece by its connection with said first-mentioned arm and means carried by the opposite parallelogram bar to pivotally support the driving tool to pivot on an axis maintained at all times normal to the work piece.

15. In an apparatus for serving screws or the like, a screw supply, a delivery tube through which screws are adapted to be transmitted to a work piece, means for delivering screws individually to said delivery tube from said screw supply, said means comprising an inclined track longitudinally slotted to receive the body of a screw or the like, an elevator having an inclined slotted track at its upper end and rising through said screw supply into alignment with the aforesaid track to form an inclined screw slide terminating adjacent the entrance to said delivery tube, means for operating said elevator, and means for depositing screws from said screw slide individually into said tube, said latter means comprising a rotor having peripheral recesses to receive individual screws mounted to rotate in close proximity to and between the end of said slide and the entrance to said tube and to carry individual screws from said slide to said tube, a wall surrounding said rotor and open at the end of said slide and entrance to said tube, and means operatively connecting said rotor to said elevator.

16. A device as claimed in claim 15 in which said last-mentioned means comprises a racking pawl engaging said rotor, a lever operated by said elevator, and a yieldable connection between said lever and pawl to rack said rotor a predetermined distance upon elevator movement.

17. In an apparatus for serving screws or the like, a screw supply, a delivery tube through which screws are adapted to be transmitted to a driving tool, and means for delivering screws individually to said tube from said supply including a screw elevator in the form of a piston reciprocable in a cylinder and operating under pressure introduced into said cylinder, and valve means for controlling exhaust of air from said cylinder, said tube terminating in a head in advance of the driving tool and being connected to said tool for limited relative motion therebetween comprising tool movement towards and away from a screw delivered to said head, and flexible connector means transmitting relative motion of said tool and tube to said valve means to introduce pressure air into said cylinder and deliver a screw to said tube upon tool movement to drive a screw, and to exhaust said cylinder and chase a screw through said tube upon lifting of said tool from a screw driving position.

18. A device as claimed in claim 17 in which a valve is interposed in said tube to close the entrance thereof upon exhausting of said cylinder.

19. In apparatus for serving screws or the like, a screw supply, a delivery tube through which screws are adapted to be transmitted to a work piece, means for delivering screws individually to said delivery tube from said screw supply, said means comprising an inclined track longitudinally slotted to receive the body of a screw or the like, an air cylinder operated elevator having an inclined slotted track at its upper end rising through said screw supply into alignment with the aforesaid track to form an inclined screw slide terminating adjacent the entrance to said delivery tube, means for depositing screws from said screw slide individually into said tube through said tube entrance, air circuit means to chase a screw delivered into said tube entrance through said tube to a work piece and a valve to close said screw entrance to said tube during chasing of a screw through said tube.

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