# United States Patent [19]

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[54] **PART FEEDING ATTACHMENT FOR FASTENER DRIVING TOOLS**


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[52] **U.S. Cl.** ..... **227/120**
[51] **Int. Cl.** ..... **B27f 7/02**
[58] **Field of Search** ..... 227/8, 18, 112, 120, 227/136



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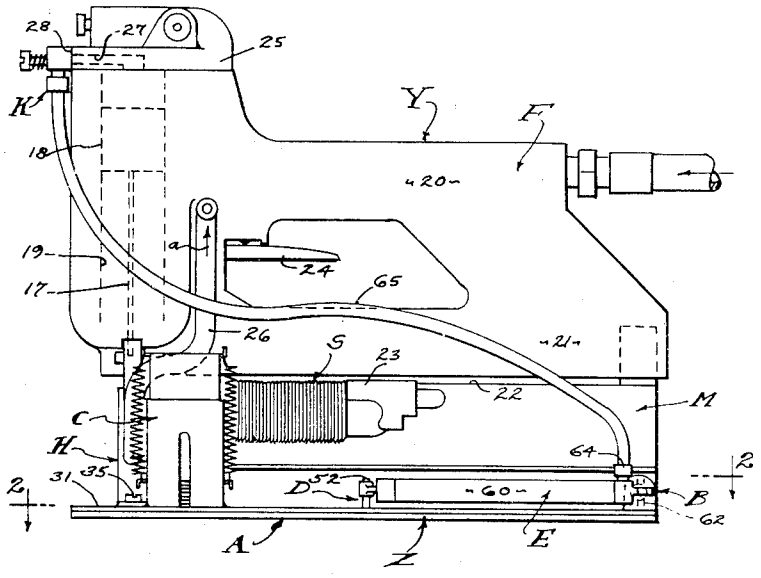
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[57] **ABSTRACT**

A part feeding attachment combined with a fastener driving tool to advance one part at a time into position to be embraced and/or pierced by a fastener delivered by said tool; especially for pneumatically powered tools driving staples and the like and to advantageously utilize exhaust air to effect automatic operation; the attachment being universally adaptable to tools of varied type and of different manufacture, and characterized by its light weight and minimized space requirements.


**20 Claims, 7 Drawing Figures**



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2 Sheets-Sheet 1

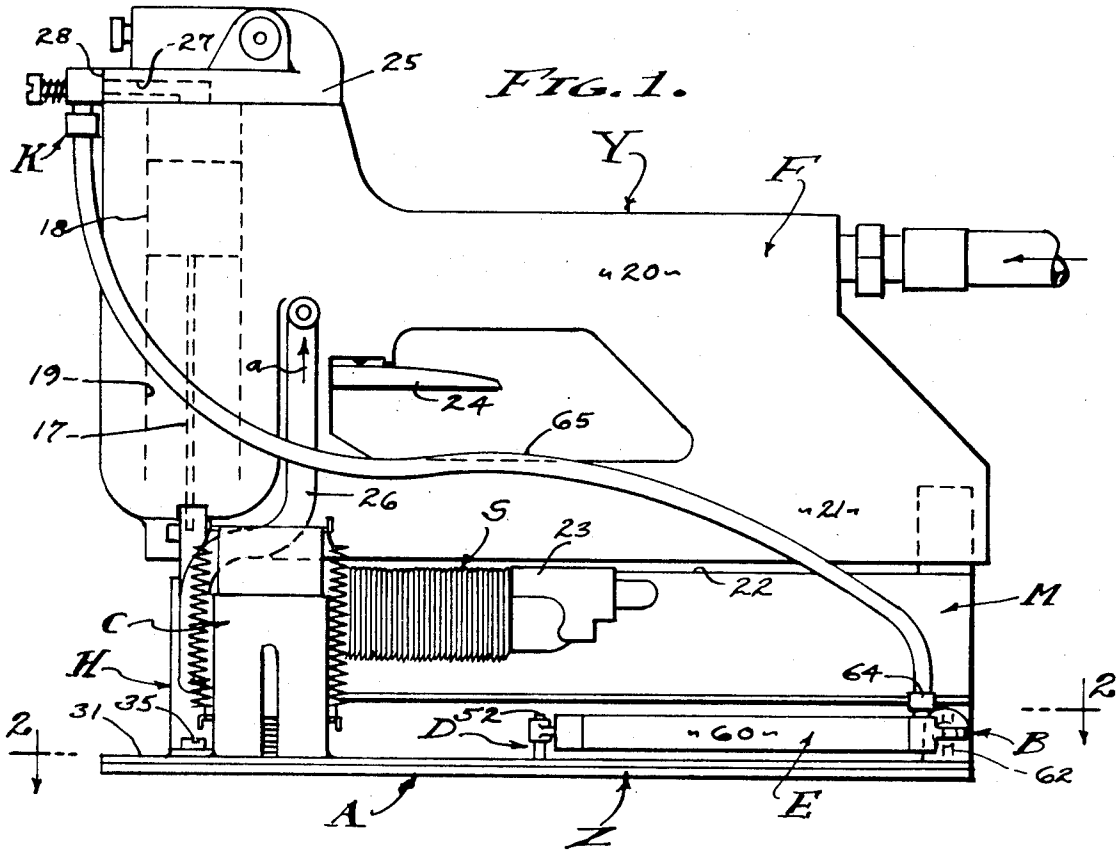



FIG. 1.

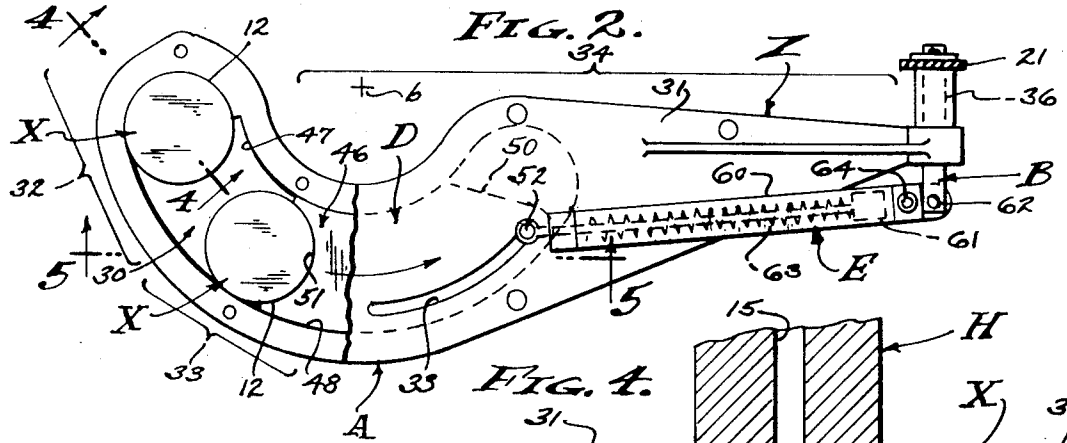



FIG. 2.

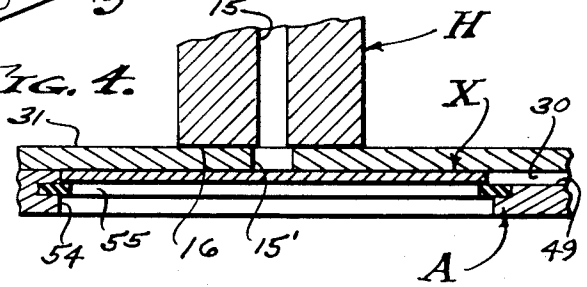



FIG. 4.

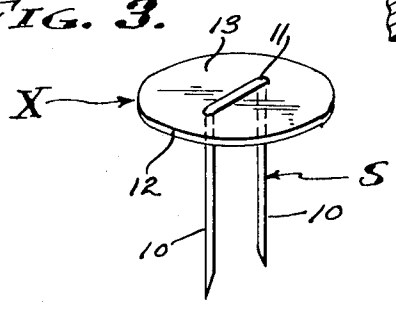



FIG. 3.

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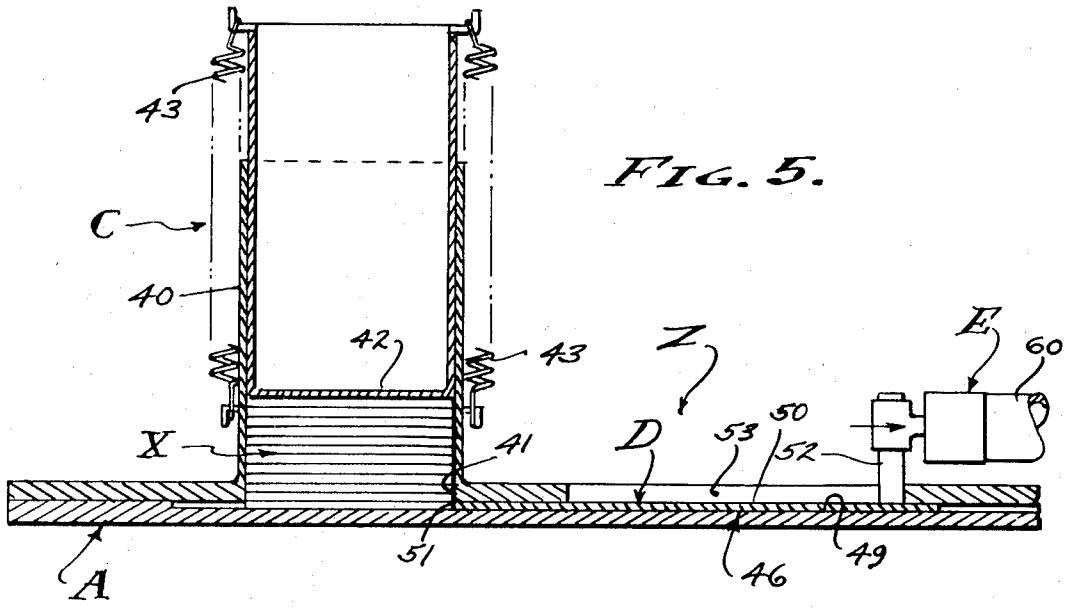



FIG. 5.

FIG. 6.

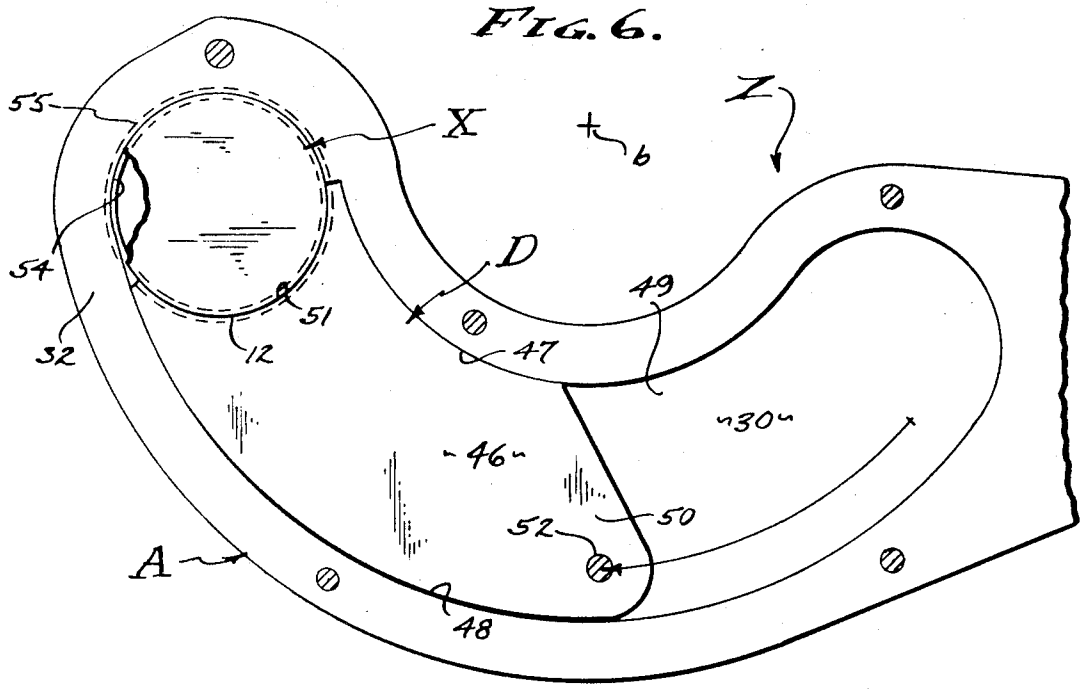
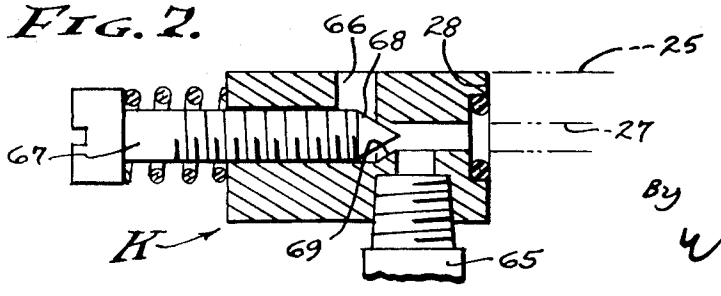



FIG. 2.




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# PART FEEDING ATTACHMENT FOR FASTENER DRIVING TOOLS

## BACKGROUND

Fastener driving tools of the fluid actuated type are characterized by an exhaust of operating fluid during the return stroke of an actuating piston. These are usually air powered tools that store the air under pressure and release it under control of a trigger to accelerate a piston and drive blade with percussive force. At the end of the work stroke, after the driver blade has forceably driven a fastener into a workpiece, the piston is returned by spring means (or is self-returned) and during which interval of time the driver blade is retracted and the expanded air pressure (residual air pressure) is exhausted.

## FIELD OF INVENTION

The exhaust air of tools of the type under consideration escapes under considerable residual pressure, usually in the nature of an audible report; and it is this residual air under pressure which is usefully employed by the attachment hereinafter described. Therefore, it is an object of this invention to provide an attachment for feeding parts into position beneath the head of a fastener driving tool by means of residual exhaust air pressure.

Fastener driving tools of the type under consideration are characterized by their ability to forceably drive fasteners into tight engagement with the workpiece to be secured. In cases where said workpieces are fragile or otherwise tender, such as thin sheets of material that tend to rip, a normal staple head will tend to pull therethrough. Consequently, it is advantageous to apply plates or washers through which the staples are driven. Therefore, it is an object of the invention to provide an attachment that feeds washers or the like into position to be pierced by the fasteners driven by the tool and to be secured beneath the heads of the staples so as to increase the ability of the workpiece to remain intact and in place secured by the said fasteners.

Attachments to tools of the type under consideration are often cumbersome in nature and are a burden to the person operating the tool. The delivery plane of the drive head is in close proximity to the lower extremity of the fastener supply or magazine and to encumber the front of the tool is prohibitive. Lateral access to the head beneath the fastener driveway must then be resorted to, but again avoiding any addition that unduly encumbers the tool. Therefore, lateral access is employed in the attachment herein disclosed, while discriminately relating the elements of the drive in the form of a part feeder that lies closely adjacent the fastener magazine without unduly encumbering the tool.

## SUMMARY OF INVENTION

With the present invention a parts feeder lies closely adjacent the usual fastener supply or magazine and is secured partially or entirely thereto as circumstances require. The parts feeder is a self-contained and independently operable mechanism that has a delivery way and parts feeder blade reciprocably operably therein to retract for reception of a part to be advanced, and operable to advance for delivery of said part into position aligned beneath the driveway of the tool. The delivery way and complementary parts feeder blade are arcuately formed and the latter is reciprocally operable through the former in an arc and powered by a cylinder and piston means automatically responsive to a controlled amount of residual exhaust air pressure. At the end of each fastener driving work stroke of the tool, a new part is fed into fastening position preparatory to the next succeeding work stroke thereby automatically preparing the tool for a part installation after each preceeding installation is accomplished.



## DRAWINGS

The various objects and features of this invention will be fully understood from the following detailed description of the typical preferred form and application thereof, throughout which description reference is made to the accompanying drawings, in which:

FIG. 1 is a side elevation illustrating a typical embodiment of the present invention wherein the part feeding attachment is combined with a pneumatic actuated fastener driving tool.

FIG. 2 is a plan section taken substantially as indicated by line 2—2 on FIG. 1.

FIG. 3 is a perspective view of the part and fastener combination that is produced through operation of the apparatus and tool combination herein disclosed.

FIG. 4 is an enlarged detailed sectional view taken as indicated by line 4—4 on FIG. 2.

FIG. 5 is an enlarged detailed sectional view taken as indicated by line 5—5 on FIG. 2.

FIG. 6 is an enlarged detailed plan section of a portion of the attachment shown in FIG. 2, showing the part feeder blade advanced to place a part in fastening position.

And, FIG. 7 is an enlarged detailed section of the manually adjustable means which governs action of the attachment and so that its action is synchronized with operation of the tool.

## PREFERRED EMBODIMENT

Referring now to the drawings, I have provided a part feeding attachment in combination with a fastener driving tool, and preferably a pneumatic tool wherein residual air pressure from the exhaust is advantageously employed for cycling said part feeding attachment. Although the part to be fed can vary widely in size and configuration, a typical part is a thin disc of stiff material such as metal and which is usefully employed to anchor a fragile workpiece; for example to anchor sheet materials of all kinds. Or the said part can be a tag or the base for another article to be carried thereby. As shown, the part X is a thin disc-shaped element that is readily pierced by a fastener such as a staple S. The staple has a pair of legs **10** joined by a head **11** which would normally pull through weak materials. Therefore, the disc X with its circular periphery **12** is held secure by means of the head **11** driven into tight engagement with the disc top **13**. The part feeding attachment Z is therefore combined with the fastener driving tool Y to place the disc X in position to be pierced by the legs **10** of the fastener and to be held down by the head **11** thereof.

The part feeding attachment is utilitarian when combined with a fastener driving tool Y having a fastener supplying magazine M extending laterally from a drive head H through which there is a guideway **15** that receives and delivers the staples S from the bottom end face **16** of the tool when the driver blade **17** is advanced by a piston **18** operating in a cylinder **19**. The

essentials of a fastener driving tool, as above described, can vary widely depending upon the type of fastener to be driven and upon the size and configuration of the fastener and/or part X to be fastened. Such tools include other mechanisms and features as clearly indicated in FIG. 1 of the drawings; including a frame F which comprises the cylinder **19** and integrally attached handle **20** and magazine mount **21**, the driving head H being carried by the frame beneath and in alignment with the cylinder **19**; including the fastener supply or magazine M which comprises a fastener guide rail **22** extending laterally from the head H and carried by and beneath the mount **21** of the frame, and a forwardly biased follower **23** that urges the fasteners S supported upon the rail **22** to enter them into the fastener guideway **15** through which the driver blade **17** propels the fastener S; including a manually controllable compressed air supply which comprises the interior of the frame which is hollow so as to store a supply of air under pressure, and a trigger **24** that operates a release valve and servo mechanism in the cylinder head **25**, so as to dump a large volume of air under pressure into the cylinder **19**; and including a safety device, for example, in the form of a trigger latch that employs a presser foot (the attachment Z in this disclosure) which shifts a linkage **26** that locks and/or disconnects the trigger **24**.

A characteristic feature of fastener driving tools of the type under consideration is that the energy of compressed air is used for actuation and which necessarily involves an exhausting of air with some residual pressure at the end of each work stroke of the tool. In practice, the said residual exhaust air pressure is in excess of that required to actuate the attachment Z next to be described, due to the forcefulness that is required when driving such fasteners. Also, the availability of exhaust air necessarily follows operation of the fastener driving tool, and it is this feature which inherently cycles the attachment Z in timed relation to the operation of said tool and thus preparing the combination (Y and Z) for the next succeeding cycle of operation. As clearly illustrated in FIG. **1**, an exhaust air passage **27** extends from the upper end of the cylinder **19** and is controlled by an air servo mechanism in the cylinder head **25** to discharge exhaust air (with residual pressure remaining therein) at the exterior face **28** of the cylinder head.

In accordance with this invention, the part feeding attachment Z is a self contained unit having utility when combined with a fastener driving tool Y or the like. The prime object is to provide the automatic feed of and positioning of parts to be individually engaged and fastened by staples or the like, and all without unduly encumbering the tool Y. Accordingly, the part feeding attachment Z involves, generally, a base A and mounting means B therefor, part supply C carried by the base, a feeder D cooperatively incorporated in the base A and related to the part supply C and tool Y to advance parts one at a time into a position aligned with the tool head H, a drive E for subsequent advancing the feeder D, and a control K for governing the amount of residual exhaust air from the tool Y at the end of each work stroke and which is employed to operate the drive E and thereby advance the feeder D.

The base A is the framework of the attachment Z and is characterized by its flattened and elongated configuration that underlies the bottom face **16** of the drive head H (see FIG. **4**). A requirement of this tool and attachment combination is that the part X must be moved to a position disposed beneath the bottom face **16** in alignment with the guideway **15** and parallel with the plane of said bottom face. Therefore, a stacked supply of said disc-shaped parts X must be laterally displaced from the head H in order to maintain said parallelism, and as shown the part supply C is carried to one side of the head and magazine M extending therefrom. Consequently, the flattened and elongated base A is extended to the same side of the head magazine to complement the part supply C and to accommodate the feeder D. As best illustrated in FIGS. **1** and **2** the base A is comprised of a laminated or stacked construction having a deliveryway **30** therein and a cover **31** that encloses said deliveryway and carries the part supply C so that it extends upwardly at one side of the tool Y. Thus, the base A has a delivery portion **32** underlying the head H, a supply portion **33** extending away from and to one side of the head H, and it has a mounting portion **34** extending to the rear or heel end of the magazine M and its mount **21**. Both the base and its cover include said portions **32–34**, being constructed of metal plates of thickness sufficient to be rigidly durable, as shown.

The mount B for the base A can vary with different tools Y, and it is shown in a form adapting the attachment Z to a tool having a trigger latch linkage **26** which requires depressible movement of a presser foot or the like; and in this instance the base A is the presser foot. Thus, articulation is required and the base A is secured to the linkage **26** to shift in the direction of arrow *a* when the tool and attachment combination is brought into engagement with a workpiece. Screw fasteners **35** secure the linkage **26** as supports to the base A and the rear most end of the mounting portion **34** is secured to mounting **21** by a pivot **36**.

The part supply C that is carried by the base A comprises a vertically disposed tube **40** that projects normally from said base cover **31** overlying a complementary opening **41** in said cover. The complementary cross section of said top and opening is that of the disc part X, with some clearance; there being a follower **42** releasably biased by springs **43** to yielding urge the stack of parts X into supported engagement upon the base A (see FIG. **5**) the supply tube **40** lying closely adjacent the side of the tool Y, alongside the magazine M.

The feeder D that cooperatively relates the parts supply C and tool Y is adapted to advance one part X at a time from the stacked supply thereof. In accordance with the invention, the attachment Z lies alongside the magazine M and functions as a result of retractably extensible operation of the drive E later described. The feeder D is unique in its arcuate configuration which enables the displacement of the part supply C to one side of the attachment Z without interference from the magazine M, and to this end the feeder D involves an arcuate deliveryway **30** and a complementary arcuate part feeder blade **46**, both formed about a common center of rotation *b*. Although the geometry of a rotational center is preferred, it is also contemplated that a curved deliveryway (not shown) is feasible, in which case one or more portions on the part feeder blade will follow the route directed by said curved deliveryway; as in a cam follower device. As shown, the part deliveryway **30** has inner and outer part guiding walls **47** and **48** tangentially coincidental with the peripheral extremity **12** of part X, and the base A is channeled for this purpose with a flat guideway bottom **49** that slideably supports the blade **46** and the disc part X moved

thereby. The cover **31** presents a top that encloses the deliveryway, there being a staple delivery opening **15** extending through said cover.

The part feeder blade **46** is arcuately elongated and has a follower portion **50** that tracks in the arcuate deliveryway **30**, there being a concave drive face **51** at its front end and a drive post **52** projecting upwardly therefrom at its rear end. The drive face **51** is complementary to the cross sectional configuration of the supply tube **40** and opening **41** and is adapted to have interface engagement with the outer periphery **12** of the part X. The drive face **51** is positioned coincidental with the opening **41** when the feeder blade **46** is retracted (see FIG. **5**) in which position the drive post **52** is at the rear of a slot **53** in the cover **31** that accommodates the required travel of the post and attached driver blade **46.** When the part driving blade **46** is in its forward most position (see FIG. **6**) the part X is stopped in alignment with the fastener guideway **15** and a downwardly opening recess **54** through the base A. Like the tube **40** of the parts supply C, the recess **54** is complementary in shape to the shape of the part X to be delivered therethrough, and in the case under consideration is round with clearance sufficient to pass the part X with facility. Thus, the side of recess **54** extending between the inner and outer walls **47** and **48** forms the stop for part X, while the drive face **51** forms the diametrically opposite positioning wall.

Referring to FIG. **4** of the drawings, the disc-shaped part X is shown stopped by said recess wall and held supported in position in alignment with the fastener guideway **15** by means of a pliable ring **55** that deflects so as to permit release of and downward movement of the part X when a fastener is driven therethrough. The ring **55** is made of a relatively soft plastic or elastomeric material and is replaceably seated in a step or groove, a small portion of its inner margin having underlapped supporting engagement with the part X. It will be apparent that forecful driving of a fastener S through the part X and engagement of the head **11** with the top **13** will pull the part X from its supported engagement upon the pliable rings **15.**

The drive E that sequentially advances the feeder D is preferably a pneumatic cylinder and piston means for coordinated operation with the pneumatic tool Y with which the attachment Z is combined. The cylinder and piston means is disposed on an axis that extends longitudinally of the base A and substantially parallel with the magazine M. As shown, the cylinder **60** of drive E is pivotally anchored at **62** on a vertically disposed axis at the extreme pivoted end of the base A, while the piston **61** is pivotedly connected to the drive post **52** by a piston rod. The piston and cylinder means of drive E is single acting with a fluid pressure connection **64** at its anchored end for pressurizing the cylinder **60** to advance the piston **61** and its rod connected to the drive post **52,** there being a return spring **63** that retracts the piston **61** and its rod connected to the drive post **52.**

The control K that governs the amount of residual exhaust air from the tool Y involves a fluid line **65** between the exhaust port **27** of the tool Y and the pressure connection **64** of the drive E. All or part of the exhaust air from tool Y can be employed to operate the drive E, and in accordance with the invention there is a bleed port **66** which permits complete exhaust from both the tool Y and the drive E of the attachment Z. In practice, only a portion of the exhaust air from tool Y need be used to gain full actuation of the cylinder and piston means of drive E, in which case the bleed port **66** is of substantial capacity. Further, controlled actuation of the drive E is desired, so as to compensate for environment and any mechanical discrepancies, there being a manually adjustable bleed screw **67** having a needle valve **68** moveable relative to a seat **69** at the port **66.**

From the foregoing it will be apparent that upon operation of the fastener driving tool Y and following release of its actuating trigger, a charge of exhaust air flows rapidly from port **27** under residual pressure. The said exhaust port **27** is restricted to flow to atmosphere through the bleed **66** by manual adjustment of screw **67,** and there is a consequent flow of residual exhaust air under pressure through line **65** to the cylinder **60.** The piston **61** of drive E is thereby advanced to place a part X in position, the previously placed part having been delivered from the attachment Z by the preceeding work stroke of tool Y. In practice, a sufficiently great restriction is applied to bleed port **66** in order to assure complete actuation of the drive E, following which the bleed port **66** permits retraction of the piston **61** under the bias of the return spring **63** and simultaneously prepares the fastener driving tool Y for the next succeeding work stroke.

Having described only a typical preferred form and application of my invention, I do not wish to be limited or restricted to the specific details herein set forth, but wish to reserve to myself any modifications or variations that may appear to those skilled in the art:

I claim:

**1.** A part feeding attachment for a fastener driving tool having fluid operated means driving a fastener and control means therefor effecting discharge of air under pressure following driving of said fastener, and including, a base having a part deliveryway therethrough extending from a part supply disposed laterally of the tool to a delivery portion thereof disposed beneath the tool in alignment with said first mentioned fluid operated means, a feeder means advancing a part from said part supply to said delivery portion responsive to said discharge of air under pressure following driving of said fastener, there being a return means retracting the feeder means after feeding said part through said delivery portion, whereby a part is advanced into alignment with said first mentioned fluid operated means to receive the next succeeding fastener driven thereby.

**2.** The part feeding attachment for a fastener driving tool as set forth in claim **1** and wherein the part supply comprises a tube disposed normal to said deliveryway and slideably passing the part, said deliveryway being of a depth to receive a part and the said feeder means slideably to advance therethrough.

**3.** The part feeding attachment for a fastener driving tool as set forth in claim **1** and wherein the deliveryway is arcuately formed and the feeder means comprises a complementary arcuately formed part feeder blade reciprocably operable through said deliveryway, said arcuate deliveryway and arcuate part feeder blade being formed about a common center for reciprocal rotation of the latter through the former.

**4.** The part feeding attachment for a fastener driving tool as set forth in claim **1** and wherein the feeder means comprises a cylinder and piston means having one end pivotally anchored to the base of the other end

pivotally anchored to a post actuating the said feeder means.

5. The part feeding attachment for a fastener driving tool as set forth in claim 1 and wherein the feeder means comprises a cylinder with a piston advanced therein by means of a fluid connection communicating thereto from the control means effecting discharge of air under pressure.

6. The part feeding attachment for a fastener driving tool as set forth in claim 1 and wherein the feeder means comprises a cylinder with a piston advanced therein by a fluid connection thereto bleeding to atmosphere and communicating fluid pressure thereto from the control means effecting discharge of air under pressure.

7. The part feeding attachment for a fastener driving tool as set forth in claim 1 and wherein the feeder means comprises a cylinder with a piston advanced therein by a controlled fluid connection thereto admitting a portion of said discharge of air under pressure.

8. The part feeding attachment for a fastener driving tool as set forth in claim 1 and wherein the feeder means comprises a cylinder with a piston advanced therein by a controlled fluid connection thereto with a bleed to atmosphere and admitting a portion of the said discharge of air under pressure to said cylinder for advancing the piston.

9. The part feeding attachment for a fastener driving tool as set forth in claim 1, wherein the feeder means comprises a cylinder with a piston advanced therein by a fluid connection thereto from the control means effecting discharge of air under pressure, and wherein the return means is a spring within the cylinder and engaging the piston to retract the same.

10. The part feeding attachment for a fastener driving tool as set forth in claim 1, wherein the part supply comprises a tube disposed normal to said deliveryway and slideably passing the part, said deliveryway being of a depth to receive the part, wherein the deliveryway is arcuately formed and the feeder means comprises a complementary arcuately formed part feeder blade reciprocably operable through said deliveryway, said arcuate deliveryway and arcuate part feeder blade being formed about a common center for reciprocal rotation of the latter through the former, wherein the feeder means comprises a cylinder pivotally anchored to the base with a piston therein pivotally anchored to a post actuating the said feeder means, said piston being advanced in the cylinder by a controlled fluid connection thereto having a bleed to atmosphere and admitting a portion of said discharge of air under pressure to said cylinder for advancing the piston, and wherein the return means is a spring within the cylinder and engaging the piston to retract the same.

11. In combination: a fastener driving tool including, a frame carrying a head with a fastener guideway opening therefrom at a delivery face, a magazine supply of fasteners for individual delivery through said guideway and extending laterally from the head, fluid operated means with a driver blade entering through and driving a fastener from the guideway in the head, and a control means effecting a drive stroke of said fluid operated means followed by a return stroke thereof and by the exhaust of residual air under pressure; and a part feeding attachment including, a base having a part deliveryway therethrough extending from a part supply disposed laterally of the tool to a delivery portion thereof underlying the delivery face of the tool in alignment with the guideway and driver blade thereof, a feeder means advancing a part from said part supply to said delivery portion responsive to said exhausting of residual air under pressure following driving of said fastener, there being a return means retracting the feeder means after feeding said part through said delivery portion, whereby a part is advanced into alignment with the guideway and driver blade to receive the next succeeding fastener driven thereby.

12. The part feeding attachment for a fastener driving tool as set forth in claim 11 and wherein the part supply comprises a tube disposed normal to said deliveryway and slideably passing the part, said deliveryway being of a depth to receive a part and the said feeder means slideably to advance therethrough.

13. The part feeding attachment for a fastener driving tool as set forth in claim 11 and wherein the deliveryway is arcuately formed and the feeder means comprises a complementary arcuately formed part feeder blade reciprocably operable through said deliveryway, said arcuate deliveryway and arcuate part feeder blade being formed about a common center for reciprocal rotation of a latter through the former.

14. The part feeding attachment for a fastener driving tool as set forth in claim 11 and wherein the feeder means comprises a cylinder and piston means having one end pivotally anchored to the base of the other end pivotally anchored to a post actuating the said feeder means.

15. The part feeding attachment for a fastener driving tool as set forth in claim 11 and wherein the feeder means comprises a cylinder with a piston advanced therein by means of a fluid connection communicating thereto from the control means effecting said residual exhaust of air under pressure.

16. The part feeding attachment for a fastener driving tool as set forth in claim 11 and wherein the feeder means comprises a cylinder with a piston advanced therein by a fluid connection thereto bleeding to atmosphere and communicating fluid pressure thereto from the control means effecting said residual exhaust of air under pressure.

17. The part feeding attachment for a fastener driving tool as set forth in claim 11 and wherein the feeder means comprises a cylinder having a piston advanced therein by a controlled fluid connection thereto admitting a portion of said residual exhaust of air under pressure.

18. The part feeding attachment for a fastener driving tool as set forth in claim 11 and wherein the feeder means comprises a cylinder with a piston advanced therein by a controlled fluid connection thereto with a bleed to atmosphere and admitting a portion of the said residual exhaust of air under pressure to said cylinder for advancing the piston.

19. The part feeding attachment for a fastener driving tool as set forth in claim 11, wherein the feeder means comprises a cylinder with a piston advanced therein by a fluid connection thereto from the control means effecting residual exhaust of air under pressure, and wherein the return means is a spring within the cylinder and engageing the piston to retract the same.

20. The part feeding attachment for a fastener driving tool as set forth in claim 11, wherein the part supply comprises a tube disposed normal to said deliveryway and slideably passing the part said deliveryway being of

a depth to receive the part, wherein the deliveryway is arcuately formed and the feeder means comprises a complementary arcuately formed part feeder blade reciprocably operable through said deliveryway, said arcuate deliveryway and arcuate part feeder blade being formed about a common center for reciprocal rotation of the latter through the former, wherein the feeder means comprises a cylinder pivotally anchored to the base with a piston therein pivotally anchored to a post actuating the said feeder means, said piston being advanced in the cylinder by a controlled fluid connection thereto having a bleed to atmosphere and admitting a portion of said residual exhaust of air under pressure to said cylinder for advancing the piston, and wherein the return means is a spring within the cylinder and engageing the piston to retract the same.

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