This invention relates to pneumatic fastening machines for staples, nails, or the like fasteners. An object of this invention is to provide a machine of the character described wherein the driving piston will not start to move until great pressure has built up, so that the piston will undergo a high initial acceleration, deliver a heavy impact blow to the fastener, and yet be of light construction so as to eliminate recoil.

Another object of this invention is to provide a machine of the character described having improved magnetic means cooperating with the main piston to hold the piston back until a considerable pressure is built up behind the main piston whereby the main piston will start moving with a high acceleration.

Another object of this invention is to provide a machine of the character described having improved sealing means at the lower end of the cylinder to allow air beneath the piston to exhaust to atmosphere during the driving stroke, said sealing means being sealed by the piston at the end of the driving stroke, and remaining sealed during the return stroke thereby permit said power return stroke, and said sealing means thereafter returning to venting condition at the end of said return stroke to thereby condition itself for the next driving stroke.

Another object of this invention is to provide in a machine of the character described means wherein the driving blade is cooperative with said sealing means to permit exhaustion of the compressed fluid beneath the piston as the piston approaches the upper end of the return stroke.

Another object of this invention is to provide a machine of the character described wherein upper and lower slide rings concentric with the piston move down together axially while in still contact with each other, during which time the piston is not exposed to the driving fluid, and then the lower slide ring moves down alone to separate from the upper ring to permit driving fluid to reach the piston to cause a driving action, and wherein the lower slide ring moves up to first contact the upper slide ring and then both slide rings move up together to their initial position and thereby seal the space above the piston from inlet pressure to permit the return stroke of the piston and exhaust of the fluid in said space to atmosphere.

Yet another object of this invention is to provide a machine of the character described having dampering members between the upper end of the upper slide ring and the housing lid, and between the lower end of the lower slide ring and the housing.

Other objects of this invention will in part be obvious and in part hereinafter pointed out.

The invention accordingly consists in the features of construction, combinations of elements, and arrangement of parts which will be exemplified in the construction hereinafter described, and of which the scope of invention will be indicated in the following claims.

In the accompanying drawing, in which is shown an illustrative embodiment of this invention,

FIG. 1 is a vertical, longitudinal section through a machine embodying the invention, with the compressed fluid connected, the parts conditioned for a driving stroke, and showing the driver blade only partially broken away;

FIG. 2 is a view similar to FIG. 1 showing the parts during the driving stroke;

FIG. 3 is a view similar to FIG. 1 showing the parts during the return stroke; and

FIG. 4 is a cross-sectional view taken on line IV—IV of FIG. 1.

Referring now in detail to the drawings 10 designates a machine embodying the invention. Machine 10 comprises a housing 11 provided with a front, vertical housing portion 11a having a bottom wall 12. Wall 12 is formed with a central opening 13. Secured to the housing 11 in any suitable manner, not shown, is a fastener guide assembly 14, to which is secured a fastener magazine assembly 15, both of which are conventional. Fasteners 15a are pressed by pusher 15b toward the rear surface of front generally flat plate 14a of said assembly 14 by spring 15c in the return of the return plate 14b of said assembly 14 forming a passage with plate 14a. The upper ends of plates 14a, 14b project up into opening 13. The lower ends of said plates form a passage 14d for a driven fastener 15a.

Mounted inside housing portion 11a, above wall 12, and within a thickened portion 16 at the lower end of said housing portion adjacent wall 12, formed with a cylindrical bore 16a, is a ring or insert 17 of rubber or the like material. Ring 17 is of annular configuration having a central opening 18 which has a lower diameter substantially equal to the diameter of opening 13, and which may taper somewhat upwardly and inwardly therefrom as shown or may be cylindrical. The top surface 19 of ring 17 is conical for the reason appearing hereinafter. Ring 17 has a reduced cylindrical outer surface 17a forming a lower external annular shoulder 17b.

A stationary vertical cylinder 20 is positioned within
housing portion 11a, and has its lower end 21 sealingly received between the outer cylindrical surface 17a of ring 17 and the inner cylindrical surface 16a of the thicker portion 16. Cylinder 20 contacts shoulder 17b and is fixed to surface 16a. Housing portions 11a is formed with an inwardly extending annular flange 22, the inner annular surface of which is of slightly larger diameter than the outer diameter of cylinder 20. Any suitable sealing means, here shown as an O ring 23, carried by flange 22 sealingly contacts the outer surface of the cylinder to form an air tight seal therewith. Portion 11a has a wall 11b surrounding cylinder 20 and spaced therefrom, between flange 22 and thickened portion 16 to form a chamber 24. Chamber 24 is sealed by O ring 23. The function of chamber 24 will appear hereinafter.

Within cylinder 20, at the lower end thereof, in adjacent relation to ring or insert 17, is a sealing member 25 of rubber or the like resilient material. Member 25 comprises an outer thin annular flange or ring portion 26, the outer peripheral edge of which abuts the inside of cylinder 20, and is formed with a circle of openings 27 for a purpose hereinafter appearing. Member 25 further comprises a central enlarged hub portion 28, a small part 29 of which extends above flange 26, and the bulk 30 of which extends below flange 26. Portion 30 is of a smaller diameter than the smallest diameter of opening 19 of ring or insert 17 so as to project down thereinto. A flat lug 31 extends downward from one side from hub 30 into opening 13 contacting the rear surface of the upper end of seal plate 14b, to hold member 25 against rotation. Member 25 is formed with a central opening 32 to receive a driving blade to be described hereinafter. Said opening 32 is a through portion 33 to sealingly engage the blade when said blade passes therethrough, and an upper groove 34 extending to opening 33 but terminating above the lower end of hub 30, as at 34a. The upper end of portion 33 may be flared as at 35 to facilitate insertion of said blade. The function and operation of member 25 will be described hereinafter.

Cylinder 20, just above the upper surface of flange 26 of sealing member 25, is formed with one or more co-level openings 36 joining the space inside the cylinder with the chamber 24. In spaced relation above openings 36, cylinder 20 is formed with one or more co-level openings 37. The space of openings 36, 37 and the function of these openings 36, 37 will be explained hereinafter.

Reciprocally mounted within the cylinder 20 is a piston, generally designated by numeral 38. Piston 38 comprises a top bored portion 39, which is preferably made of steel or other material which will be attracted to a magnet. Body portion 39 comprises an upper annular flange portion 40 which is of somewhat smaller diameter than the inside diameter of cylinder 20. The upper surface of body portion 39, may be provided with shallow grooves (not shown) to facilitate seepage of the working fluid under pressure above the piston, in the manner more clearly described hereinafter. Body portion 39 has a central portion 41 projecting downwardly. Surrounding said portion 41 is an axial bushing 42. Portion 41 is formed with a suitable slot to receive the upper end of a driver blade 43. Passing through suitable openings in bushing 42, portion 41 and driver blade 43, is a hollow driver blade retaining pin 44. When the piston is in its uppermost position, the lower end of blade 43 is somewhat above the lower end of groove 54. Surrounding bushing 42, and extending up to the undersurface of flange 40, projecting below the undersurface of portion 41, is a dampening ring 45, which may be made of rubber or the like resilient material. Piston 38 is sealed into the cylinder by an O ring 46 disposed in a suitable space between 34a and groove 54. Piston 38 has an inner lip 45e engaging the top edge of bushing 42.

The upper end of cylinder 20 is formed with an enlarged outwardly extending annular flange portion 47 hav-
inner end of slot 79, lower flange 78 is formed with a circle of passages 80 extending downwardly therefrom and communicating with the space above the piston 35. At its upper surface, flange 78 is formed with means to receive a sealing ring 81 which extends up into slot 79, and which is integrally connected with the radially inner surface 77a of upper flange 77. Flange 78 has an outer cylindrical surface 78a. The radially outer cylindrical surfaces 77a, 78a of flanges 77, 78 are formed with means to receive sealing O rings 82, 83, respectively. Body portion 72 is formed, at its axially lower surface, radially inwardly of the outer flange, with a recess receiving a permanent magnet 84. Block 84 may be held securely in place by any suitable means.

Positioned radially outwardly of flanges 77 and 78, is an upper valve slide ring generally designated by numeral 85. Slide ring 85 comprises an upper ring or sleeve portion 86 and a lower cylindrical ring or sleeve portion 87. Portion 86 has an inner cylindrical surface 87a which is in sliding, sealing contact with O ring 82; an annular surface contacted by said outer end of said member 74; and a radially outer cylindrical surface 86a formed with means to receive an O ring 89 which is in sliding, sealing contact with the radially inner surface 60a of lid or cap flange 60. An annular seal is formed at the lower end of portion 86, radially outwardly of surface 88, which is adapted to contact the sealing ring 78 as will appear more clearly hereinafter. At the juncture of ring portion 86 and ring portion 87, slide ring 85 is formed with a circle of openings 91. Ring portion 87 comprises an inner cylindrical surface 87c which is in sliding, sealing contact with O ring 83, and an outer cylindrical surface 87b formed with means to receive an O ring 92 which is in sliding, sealing contact with surface 11d of housing 11. Ring portion 87 also comprises a bottom annular surface 93 formed to receive a sealing ring 94 which has a portion extending downwardly below said bottom surface 93. The lowermost surface 95 of sealing ring 94 is of smaller radial extent than surface 93; is positioned between the inner and outer peripherals of the surface 93; comprises a second control surface; and cooperates with the first control surface 95, as will appear more clearly hereinafter. Upper slide ring 88 may move between the FIG. 2, and FIG. 3, positions. The upper slide ring 88 comprises the lower slide ring portion 87 which has said lower surface 93 and is of the same or less radial extent than said lower slide ring 86; and also comprises the upper slide ring portion 87a which has a greater radial extension directed inwardly. The radial dimensions of ring portions 87 and 84 are substantially the same.

Slide ring 85 may be replaced by separate ring portions 86 and 87. When the slide rings are in contact as shown in FIGS. 1 and 2, the area of the bottom surface of lower ring portion 86 plus the area of upper surface 89 on said seal ring 94 is greater than the area of the upper surface of upper ring portion 86 plus the area of the portion of surface 93 on said seal ring 94.

Extending rearwardly from the upper rear side of housing portion 11c is a handle 96 forming a reservoir chamber 104. Said handle comprises a top wall 96a, side wall 96b, and a bottom wall 96c. Inclined downwardly and rearwardly from the lower end of wall 96c is a wall 97 connected at its lower end to wall 11b by a web 97a. Extending rearwardly from wall 97 is a wall 100 which at its rear end is connected by wall 101 to bottom wall 102. A wall 103 connects wall 102 with wall 11b forming a reservoir portion 115. Housing portions 11c and the upper end of housing portion 11b at about the level of the lower end of insert 71, at the rear side thereof, is formed with an inlet slot 98 which communicates with an annular channel 99 formed in said housing portion, just above cylinder 20. Chamber 105 has side walls enclosing the same. Wall 97 is formed with a through passage 107 connecting chamber 105 with the space 107a beneath slide ring 84.

Walls 96a, 96b, 97, 100, 101, 102 and the rear of housing 11, as well as other walls not shown, define a pressure input chamber, 104. Air under pressure, or any other suitable working fluid, is supplied to chamber 104 by any suitable means (not shown). Chambers 104 and 105 are selectively interconnected by way of a passage 106 formed in wall 101.

Slidable mounted in a bushing 108 mounted in a vertical opening in wall 103, is a valve pin 109 which, when moved upwardly to the position of FIG. 2, closes passage 106. Bushing 108 and valve pin 109 are such that when the pin is in the FIG. 2 position, a working fluid in chamber 105 is vented to atmosphere around said valve pin, and when said pin is in the FIG. 1 or FIG. 3 position, chamber 105 is sealed from atmosphere by way of O ring 110 on said pin cooperating with the top of the bushing 108.

A trigger blocking pin 111 is provided, and comprises an upper portion 111a, a lower portion 111b, and a reduced neck portion 114 between the upper and lower portions. Portion 112 is slidable and sealingly mounted in a bushing 115 fixed in an opening in wall 103 by way of an O-ring 116 carried by said pin portion 112. Lower portion 113 is slidable and mounted in a bushing 117 which is mounted in a flange 118 extending downwardly from the rear side of the housing portion 11a between vertical side flanges 120 which extend from wall 103, downwardly past flange 118, and to a level at or below bottom wall 12. The bottom end of portion 113 is formed with an inverted V-notch 119.

Pivoted mounted on said flanges 120, between wall 103 and flange 118, as on pivot pin 121, is a trigger 122. Extending from trigger 122, closely adjacent pin 111, are upper and lower trigger movement blocking pins 123 and 124 respectively. Trigger 122 also includes a flange 125 which serves to both actuate pin 109 by contact with the upper surface thereof, and to actuate the machine by providing a place for the operator's finger, on the lower surface thereof.

Flanges 120, below flange 118, are formed with slots 126, in which is guided a transverse, horizontal pin 127. Attached to and extending downwardly and forwardly from outer ends of pin 127 are connecting members 128 disposed on opposite sides of assembly 15. Attached to the lower ends of connecting members 128 is a work engaging plate 129 which extends down below the lower end of fastener guide assembly 14 when the machine is not on the work, in which position pin 127 is at the lower end of slots 126. The lower ends of members 128 may be slidably connected to assembly 14 in any suitable manner.

OPERATION

In the drawings, plate 129 is shown in its upper position and the machine on a piece of work W. When the machine is not in contact with work, the plate 129 extends down below the lower end of assembly 14, pin 127 is at the lower end of slots 126, and pin 111 is in a portion lowered position. The parts 111 and 127, 128 and 129 will move down by their own weight. When the pin 111 is in the position shown in the drawing, the trigger may be actuated since pin 123 may move into the recess or groove around neck portion 114, and pin 124 may move away from portion 113. When the plate 129 is down, as when no work is in position, the pin 111 will be down, and the trigger may not be actuated in either direction, since the pins 123 and 124 are on opposite sides of the pivot 121, and they are both in contact with the slidable pin 111.

Assuming the machine is connected to a source of compressed air, so that reservoir chamber 104 receives fluid under pressure, and the trigger has not yet been actuated, chambers 105, 66, and 99, passages 106, 107, 68, and 67, and the space under the ring portion 51 of the lower slide ring 50 are all under pressure because they are all exposed to said reservoir. The two slide rings 50 and 85 will be in the upper position shown in FIG. 1.
because the effective upward pressure is larger than the effective downward pressure. Passages 30 at this time are vented to atmosphere through passages 37, 13 and slot 70. The top of piston 36 is isolated, since control surfaces 59 and 95 are in contact thereby closing the inlet 95 to the cylinder and thereby preventing fluid under pressure from the reservoir to reaching the cylinder. The space below piston 36 is vented to atmosphere through passages 37, 13 and slot 79, openings 91, and slot 70. When the trigger is actuated upwardly, passage 106 is closed; chamber 105, passage 107, and the space below the lower slide ring are vented to atmosphere around pin 109. The effective downward pressure on the upper slide ring then forces the two slide rings to move downwardly together. However, the main piston 38 is still not exposed to pressure since the slide rings move together. This motion continues until the upper slide ring 85 is stopped in its downward movement by contact of annular portion 90 on sealing ring 81, and seals off vent slot 79. Pressure operates on that portion of control surface 59 which is radially outward of sealing surface 95 to move the slide ring 50 downwardly. As soon as the control surfaces 59 and 95 separate, the entire control surface 59 is exposed to pressure. The lower slide ring moves down to the lower end of FIG. 2. Upon the separation of the control surfaces 59 and 95, the main piston 38 is exposed to pressure. Before the piston starts to move down, there is metal to metal contact between the piston 38 and the lower end of insert 71 and magnet 54. The net pressure builds up in the fine grooves (not shown) in the upper surface of the piston and/or the lid insert. Compressed air also seeps into the now sealed passages 80 and slot 79. Due to the magnetic grip between magnet 54 and the top of piston 36, the piston does not start its driving stroke until the pressure has built up sufficiently so that the magnetic grip is broken. Therefore, when the piston 38 does start its driving stroke, it does so with a large initial acceleration.

The driver blade then drives the frontmost fastener in assembly 15, into the work, in a well known manner. As the piston 38 reaches the end of its driving stroke, the bottom of the rubber ring 45, and the bottom of the body portion 41 of the piston contact the sealing member 25 and pushes the sealing member into the position thereof shown in FIG. 3, thereby sealing the passages 27. At this same time, the top surface of the piston 38 is below openings 37, and chamber 24 is open to air under pressure, when the trigger is released, chamber 105 is again sealed from the atmosphere; passage 106 is opened, and chamber 105 and passage 107 become pressurized because of communication with the reservoir 104. The pressure on the bottom of the lower ring portion of the lower slide ring is then greater than the pressure on control surface 59, and the lower slide ring moves up until the control surfaces 59 and 95 meet. Then the effective upward pressure on the slide rings is greater than the effective downward pressure on the slide rings, and the slide rings move up together to the FIG. 1 or FIG. 3 position, thereby causing passages 80 and slot 79, and the space above piston 38, to be vented to atmosphere, through slot 70.

The pressurized fluid entrapped in chamber 24 exits through openings 36 and fills the annular space below the piston and its O rings 46 and between the cylindrical outer ring of ring 45 and the bottom of which starts the piston on its upward return stroke, and again covers openings 37 so that the air under pressure in chamber 24 is not vented to atmosphere through passages 80, slot 79, openings 91 and slot 70, as it would, were it allowed to pass through openings 37 to the space above piston 38. As piston 38 moves above openings 37, air under pressure moves from chamber 24 through both openings 36 and 37 to the cylinder and below the piston. The piston is thus raised until magnet 54 attracts it in its up position. During this time sealing member 25 still seals the space below the piston against venting, because of the compressed air entering said space from chamber 24.

As the piston approaches the end of its return stroke, the end of blade 43 rises above the end 34a of groove 34 in the sealing member 25. The pressurized fluid under the piston 36, and any remaining pressure in chamber 24, is then vented to atmosphere around the lower end of blade 43 and exit through the opening 32 in sealing member 25. The action relieves the downward pressure on member 25, which returns to the FIG. 1 position due to the resiliency of the material in annular ring or flange portion 26.

The space 82 above the lower portion 51 of slide ring 50 and below the thickened or flange portion 47 of cylinder 20 is always vented to atmosphere through openings 57, groove 56, and openings 82.

The parts have now completed a cycle and are conditioned for another cycle.

It will thus be seen that there is provided an apparatus and article in which the several objects of this invention are achieved, and which is well adapted to meet the conditions of practical use. As possible embodiments might be made of the above inventive principle, variations might be made in the embodiment above set forth, it is to be understood that all matter herein set forth and shown in the accompanying drawings, is to be interpreted as illustrative and not in a limiting sense.


2. The combination of claim 1, means to cause the means to cause the cylinder reciprocably housing said piston, means providing a reservoir of fluid under pressure, means providing an inlet of said fluid to said cylinder to one side of said piston, valve means to seal said inlet, said valve means comprising a pair of valve members movable relative to each other and relative to said cylinder, stop means, and means controlled by fluid from said reservoir for moving said valve members while in contact with each other, a limited distance relative to said cylinder, without breaking the seal to the inlet, to cause one of said valve members to engage said stop means, and further moving the other of said valve members relative to said cylinder, to move away from said one valve member, and break said seal to the inlet and allow fluid from the reservoir into said cylinder to said cylinder.

3. The combination of claim 1, means to vent the space in said cylinder above said piston in one position of said valve members, and means to close said vent means when said one valve member contacts said stop means, and to retain said vent means closed while said other valve member moves away from said one valve member.

4. In a fastener driving machine, a driving member, a pneumatic piston for actuating said driving member, a cylinder reciprocably housing said piston, means providing a reservoir of fluid under pressure, means providing an inlet of said fluid to said cylinder to one side of said piston, said piston, slide rings being slidable axially of the cylinder and relative to each other, and said inlet being sealed when said slide rings are in contact with each other.

5. In a fastener driving machine, a driving member, a pneumatic piston for actuating said driving member, a cylinder reciprocably housing said piston, means providing a reservoir of fluid under pressure, means providing an inlet of said fluid to said cylinder to one side of said piston, said piston, slide rings being slidable axially of the cylinder and relative to each other, and said inlet being sealed when said slide rings are in contact with each other.
9 fluid from said reservoir to move said slide rings together in one direction a limited distance relative to said cylinder, without breaking said seal.

6. The combination of claim 5, said stop means comprising said lid means, said upper and said lower slide rings while permitting the other slide ring to move, and said causing means causing the other slide ring to continue movement relative to said cylinder, in said direction to separate from said one slide ring to thereby break the seal and permit fluid from the reservoir to pass through said inlet to said cylinder.

7. The combination of claim 6, and means to cause fluid from the reservoir to move said other slide ring in an opposite direction until it contacts said one slide ring, and then move both said slide rings together in said opposite direction back to said initial position.

8. The combination of claim 7, means to vent the space in the cylinder above said piston, and means controlled by said one slide ring to control said vent means.

9. The combination of claim 4, said slide rings comprising an upper slide ring and a lower slide ring, a first passage connecting said reservoir with the underside of the lower slide ring, a second passage connecting said reservoir with the underside of the upper slide ring, the lower slide ring having an effective upward pressure area greater than the effective downward pressure area of the upper slide ring when said slide rings are in contact, valve means to close communication between the first passage and the reservoir and to vent said first passage to atmosphere.

10. The combination of claim 9, means to vent air from the cylinder and above the piston, and means on the upper slide ring to limit movement of the upper slide ring and close the vent means for the cylinder.

11. In a faster driving machine, a driving member, a pneumatically piston for actuating said driving member, and a cylinder reciprocally housing said piston, means providing a reservoir of fluid under pressure, means providing communication between the fluid reservoir and the cylinder, on the upper side of said piston, valve means to control passage of said fluid from the reservoir to said cylinder, a chamber surrounding said cylinder, a ring at the lower end of said cylinder formed with a central opening vented to atmosphere, a sealing member having a flexible flange overlying the upper end of said central opening and a central projection extending into said central opening, said flange being formed with an opening overlying the upper end of said ring, the upper end of said ring being tapered downwardly and inwardly, said hub being formed with a slot therein extending to said flange and sealingly receiving said driving member, said hub being furthermore formed with a groove communicating with said slot and extending to the upper end of said hub and terminating at its lower end above the lower end of said hub, the length of said driving member being such that when the piston is in its uppermost position, the lower end of said driving member will be disposed above the lower end of said groove, and said cylinder being formed with an opening adjacent to and above said flange and with an opening above the first opening and located above the piston when the piston is in its lowest position, said opening in said cylinder communicating with said chamber, said piston being provided at its underside with an annular ring having at its underside a surface tapered inwardly and downwardly and adapted to press said flange down against the upper surface of the ring at the lower end of the cylinder to close the opening in said flange.

12. In a pneumatic driving machine, the combination comprising a housing, a lid for said housing, a cylinder strutted thereto, said strut being axially movable, said cylinder being in spaced relation to the lower end of said lid, an upper slide ring surrounding said lid and axially movable relative thereto, a lower slide ring surrounding the upper end of said cylinder and axially movable relative thereto, the upper end of said lower slide ring comprising a first control surface, the lower end of said upper slide ring comprising a second control surface, said control surfaces being in facing relation and adapted to form a seal when said slide rings are in contact with one another, a portion of said first control surface being located outwardly of the second control surface when said surfaces are in contact, the upper surface of said upper slide ring being of larger area than either of said first and second control surfaces, the area of the lower surface of the lower slide ring plus the area of the portion of the second control surface, if any, located outwardly of the seal between said first and second control surfaces, being greater than the area of the upper end of the upper slide ring plus said portion of the first control surface located outwardly of said seal.

13. In combination, a housing, a lid means at the top of said housing, a cylinder stationarily mounted within said cylinder and below said lid, said cylinder being open at the top, a piston reciprocally mounted in the cylinder, drive blade means mounted on said piston, said housing or the cylinder to a chamber surrounding the space between the upper end of said cylinder and the lower end of said lid means, an upper slide ring and a lower slide ring coaxially with said cylinder, a compressed fluid reservoir formed in said housing communicating with said chamber, means to control passage of said fluid to the upper end of said upper slide ring, means to selectively expose the space beneath the lower end of said lower slide ring to atmosphere or to seal said fluid, said upper slide ring surrounding a portion of said lid means and being axially movable relative thereto, said lower slide ring surrounding the upper end of said cylinder and being axially movable relative thereto, said slide rings each having an upper and a lower position, said slide rings having means to form a fluid tight seal therebetween when their facing surfaces are in contact, and said slide rings being adapted to move in unison with said facing surfaces in sealing engagement during all of the range of movement of said upper slide ring and during a portion of the range of movement of said lower slide ring.

14. The combination of claim 13, means at the bottom end of the cylinder to selectively seal the bottom end thereof or vent the cylinder to atmosphere, said drive means passing through said means at the bottom of the cylinder.

15. The combination of claim 13, permanent magnet means in said lid means at the lower end thereof engageable with the upper surface of said piston, said piston being formed at least partially of material which will be attracted to the magnet means.

16. The combination of claim 13, fluid passage means formed in said lid means joining the space above said piston to atmosphere, said upper slide ring having means cooperating with said lid means to form a fluid tight seal to seal said fluid passage means when said upper slide ring is in the lower position thereof.

17. The combination of claim 14, piston return means comprising a chamber formed in the lower end of said housing and surrounding the lower portion of said cylinder, said cylinder being formed with a first opening closely adjacent the lower end of said cylinder and a second opening in spaced relation above the first opening, said piston having an axial extent somewhat less than the distance between said openings, whereby as said piston approaches the lower end of its travel, said second opening is exposed to said fluid to fill said chamber with said fluid, said fluid then exiting to the space below said piston through said first opening to return said piston upwardly; said sealing means at the bottom of the cylinder being sealed during the return stroke.

18. The combination of claim 14, said sealing means
at the bottom of the cylinder comprising an annular sealing insert mounted between the bottom end of the cylinder and a bottom wall of the housing, said sealing insert comprising a tapered annular top surface, said sealing means further comprising a resilient sealing member having a flange portion overlying said annular surface of said sealing insert, said flange portion being formed with fluid passages, said bottom wall of said housing being formed with said opening exposed to atmosphere, said annular sealing insert surrounding said opening, said sealing member being formed with means to form a fluid tight seal with said blade as said blade passes therethrough, the end of said blade being in non-sealing engagement with said housing when said blade is in substantially the upper position thereof, the lower end of said piston urging said resilient sealing member into engagement with said sealing insert to seal said sealing member passages when said piston is in the lower position thereof, whereby the space below said piston is sealed from atmosphere.

19. In a fastener driving machine, a driving member, a pneumatic piston for actuating said driving member, a cylinder reciprocably housing said piston, means providing a reservoir of fluid under pressure, means providing communication between said fluid reservoir and the cylinder on one side of said piston, valve means to control passage of said fluid from the reservoir to said cylinder, finger actuated trigger means to control said valve means, means for releaseably blocking the trigger means against finger actuation, and work engaging means for releasing the blocking means, to permit said trigger means to be finger actuated, said trigger means having a pivot, said blocking means being movable between an upper and a lower position, said blocking means comprising an upper portion, a lower portion, and a reduced neck portion interconnecting said upper and lower portions, a first pin on said trigger means above said pivot, a second pin on said trigger means below said pivot, both of said pins being in contact with said upper and lower portions respectively of said blocking means in one of the positions thereof, and one of said pins being aligned with said reduced neck portion in the other position of said blocking means.

20. A pneumatic fastener driving machine comprising a housing having a front part provided with a top end, and a projection extending down from the top end, a cylinder within the front part of the housing concentric with said projection, a piston reciprocably mounted within said cylinder, a drive blade fixed to the piston and extending downwardly therefrom, said housing being provided with a reservoir for air under pressure and an inlet connecting the reservoir with the upper end of the cylinder and below said projection, valve means to control said inlet and comprising an upper slide ring slidable relative to said cylinder, and a lower slide ring slidable relative to said cylinder and relative to said upper slide ring, between and sealed to said housing and cylinder, and means to seal said slide rings to each other and close said inlet when said slide rings are in contact with each other and move together relative to said cylinder while permitting the lower slide ring to continue moving away from said upper slide ring to thereby break the seal to the inlet, stop means to limit movement of the upper slide ring and means to continue movement of the lower slide ring away from said upper slide ring to thereby break the seal to the inlet.

21. A pneumatic fastener driving machine comprising a housing having a front part provided with a top end, and a projection extending down from the top end, a cylinder within the front part of the housing concentric with said projection, a piston reciprocably mounted within said cylinder, a drive blade fixed to the piston and extending downwardly therefrom said housing being provided with a reservoir for air under pressure and an inlet connecting the reservoir with the upper end of the cylinder and below said projection, valve means to control said inlet and comprising an upper slide ring slidable relative to said cylinder, and a lower slide ring slidable relative to said cylinder and relative to said upper slide ring, between and sealed to said housing and cylinder, and means to seal said slide rings to each other and close said inlet when said slide rings are in contact with each other and move together relative to said cylinder while permitting the lower slide ring to continue moving away from said upper slide ring to thereby break the seal to the inlet, stop means to limit movement of the upper slide ring and means to continue movement of the lower slide ring away from said upper slide ring to thereby break the seal to the inlet.

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