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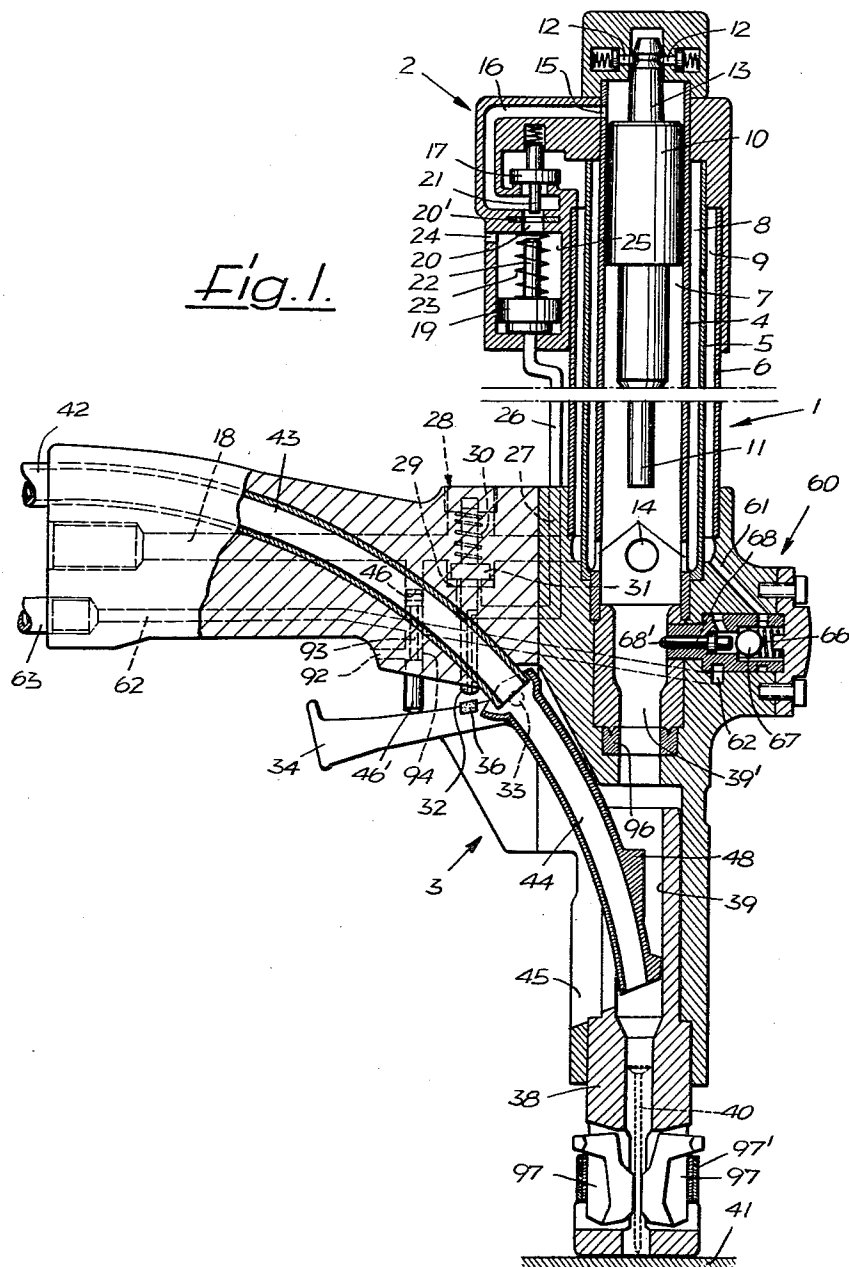
A. DUPUY ETAL

3,049,713

PNEUMATIC NAILING MACHINE

Filed Sept. 21, 1959

5 Sheets-Sheet 1



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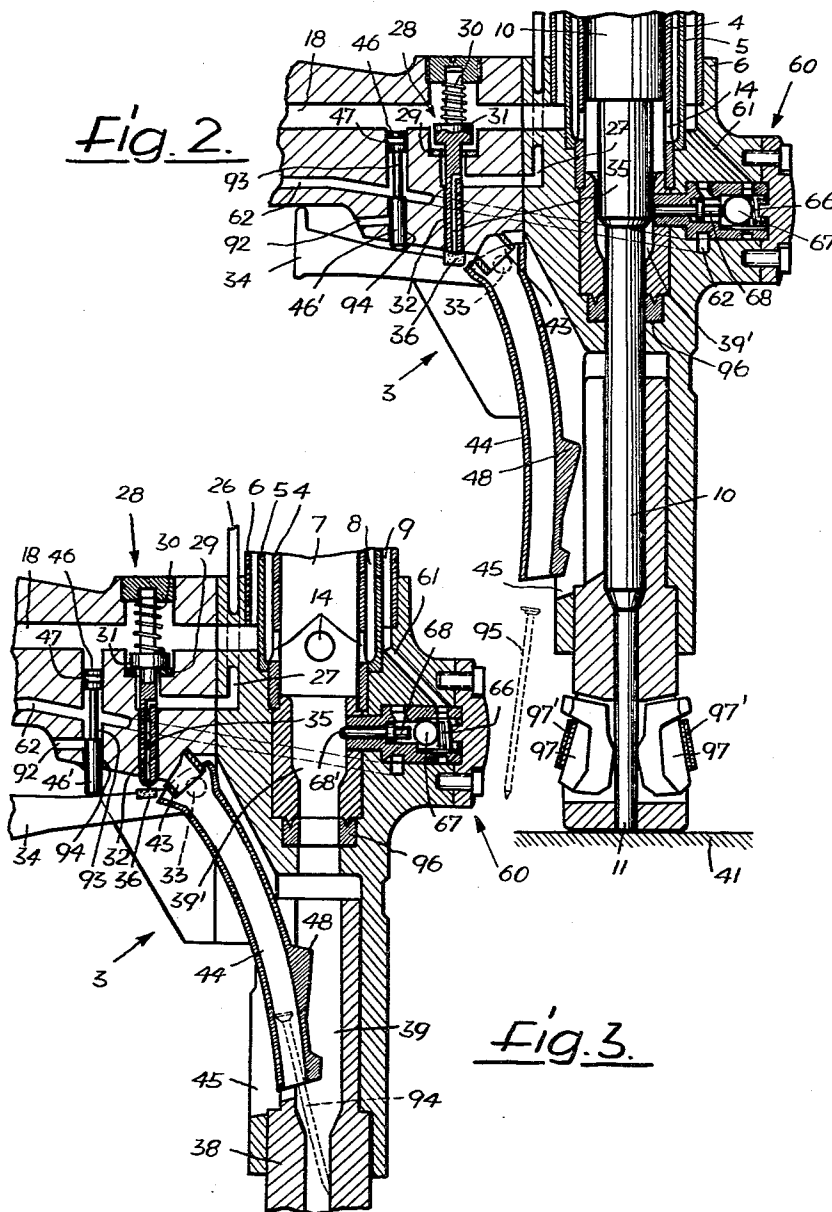
A. DUPUY ETAL

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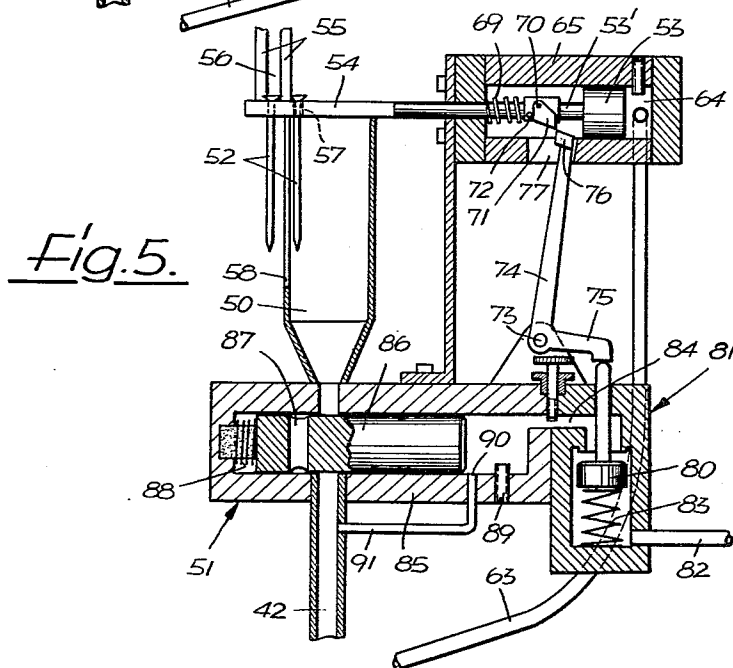
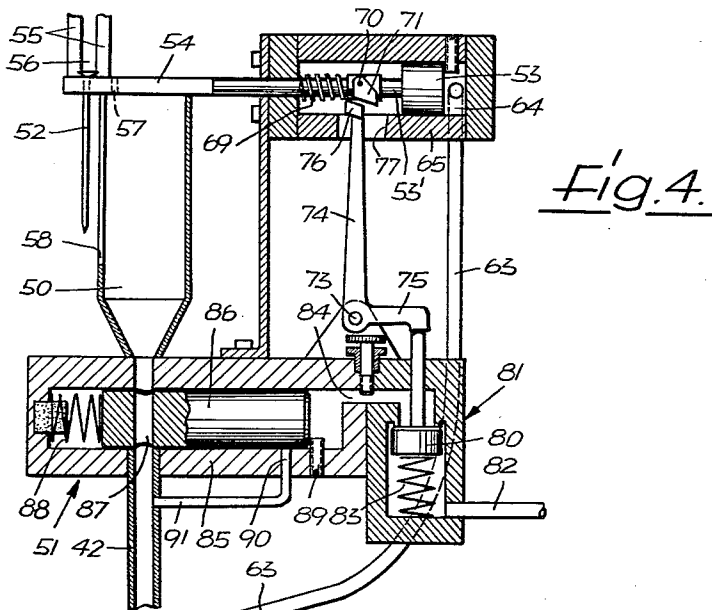
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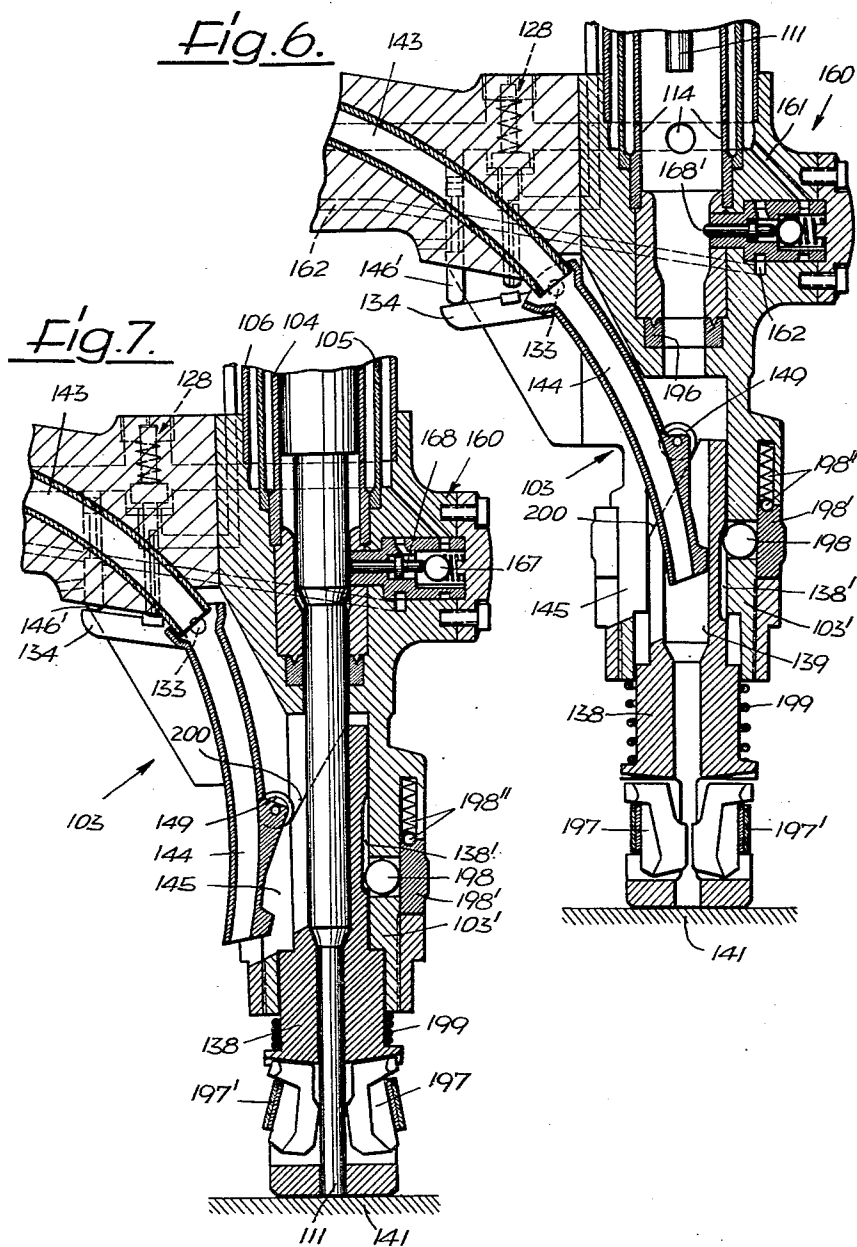
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PNEUMATIC NAILING MACHINE

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5 Sheets-Sheet 4



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PNEUMATIC NAILING MACHINE

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Fig. 8.

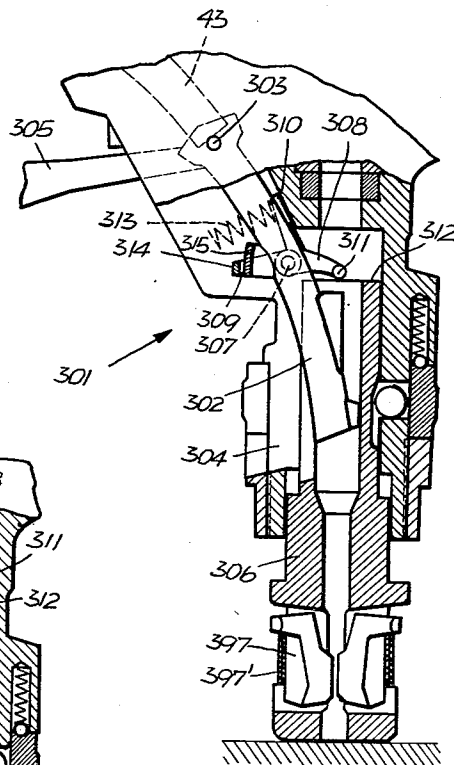
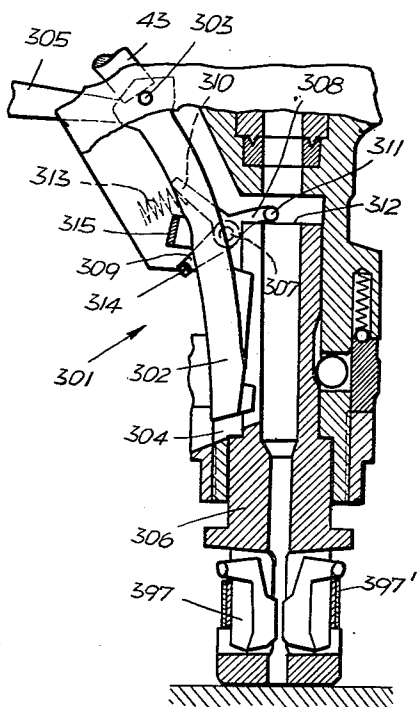


Fig. 9.



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PNEUMATIC NAILING MACHINE

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The present invention relates to improvements in a pneumatic nailing machine for driving nails, pins, and the like into walls or other solid objects by means of a piston which is slidable in a cylinder under the action of compressed air.

These machines are usually provided with a main ram piston with a striker pin thereon which, when forwardly propelled, passes into a driving channel in the nozzle of the machine so as to hit upon a nail or the like which is previously inserted into this channel. The nails are usually supplied to the machine by compressed air from a special feeding mechanism through a feed line entering into the driving channel at a lateral side thereof.

In any of the prior nailing machines of this type, this lateral insertion of the nails into the driving channel necessitated an angular bend in the channel of the machine connecting the feed line with the driving channel. Such an inclined entry of the feed channel into the driving channel in any event prevented a proper lateral guiding of the nail at the most critical point so that it could easily happen that the nail did not arrive in the driving channel in the proper position, coaxially to the striker pin with the result that the latter did not strike the head of the nail squarely, but at an angle and thereby bend the nail. Worse, however, since the nail had to pass into the driving channel at an angle thereto, it first had to strike against the wall in the wider upper part of the driving channel at a point opposite to its point of entry from the feed channel and had to be deflected thereby before it could pass into the actual driving channel. This striking and deflection of the nail necessarily slowed down its movement considerably, and sometimes even to such an extent that the nail would not enter fully into the driving channel but remain partly in the feed channel and at an angle to the axis of the piston and striker pin. Then, at the time of the next propulsion of the latter, the striker pin would not hit the nail upon its head but upon its shaft, and thereby not only bend the nail but become tightly wedged therewith and locked in the wider upper part of the driving channel. This, in turn, at least required a disassembly of the machine to remove the obstruction, but it often also resulted in serious damage of the machine.

It is an object of the present invention to design a pneumatic nailing machine of the type as described above in which this disadvantage is completely eliminated so that the machine will remain in a proper operative condition for a very long time despite frequent or continuous use.

An essential feature of the invention for attaining this object consists in designing the feed channel of the machine so as to lead to a uniform curvature into the driving channel and to maintain its guiding effect upon the nail until the latter has entered completely into the driving channel and arrived in a position exactly coaxially to the driving piston and its striker pin. Such continuous guiding of the nail until it has passed completely into the driving channel requires that at least the end portion of the feed channel may be moved into the wider upper part of the driving channel at the time of the insertion of a nail into the latter, and that it may thereafter be retracted

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from the driving channel so as to be completely out of the way of the striker pin during its subsequent forward propulsion for driving the nail from the nozzle into a solid object.

According to one preferred embodiment of the invention, this may be attained by designing the front end of the uniformly curved feed channel as a separate member which is pivotable relative to the rear part thereof as well as into and out of the driving channel. Another feature of the invention consists in coupling the device for pivoting this feed member, or the feed member itself, with a trigger which is adapted to release the ram piston so as to be forwardly propelled by the compressed air. By this combination it is possible to insure at all times that the release of the ram piston will be dependent upon the position of the front end of the pivotable feed member so that such a release and the subsequent forward propulsion of the piston and striker pin cannot occur until the front end of this feed member and the mouth of the feed channel have been withdrawn from the driving channel. This also means that the ram piston cannot start its driving movement until a nail has arrived in its proper position coaxially with the piston and striker pin so that any possibility that the striker pin might not hit the nail squarely on the head and might bend the nail, or that it might even become wedged together with the nail in the driving channel will be completely eliminated. According to the invention, the pivotable feed member is movable within a lateral slot in the nozzle of the machine. The lower end of said slot is disposed closely adjacent to the end of the feed member. Thus, if for some reason a nail should not enter fully into the driving channel but remain partly in the feed channel within the pivotable member, the nail itself will prevent the feed member from being completely pivoted out of the driving channel which, in turn, prevents the full actuation of the trigger and thus the actuation of the release mechanism of the ram piston which cannot occur until the trigger is pulled back almost completely to its end position and until it has pivoted the feed member completely out of the driving channel. The pivotable feed member therefore also serves as an automatic lock of the release mechanism if the feed member is not fully withdrawn from the driving channel. Although various means may be provided to transmit the movement of the trigger to the pivotable feed member, the most reliable and effective actuation of the latter will be attained by making the trigger and feed member in the form of one integral pivotable element. Thus, the actuation of the feed member will be positive and any play or backlash between the trigger and the feed member will be avoided regardless of how old the machine might be and how much its movable parts might have become worn.

Another feature of the invention consists in designing the nailing machine so that, if for some reason a nail to be fed to the driving channel should get stuck within the pivotable feed member and fully remain therein, the feed member may be pivoted to such an extent that the mouth of the feed channel therein will terminate toward the outside so that the nail may either drop out of its own accord or be easily removed from the feed member without causing any damage to the machine. In order also to avoid the possibility that a nail might accidentally be fed to the machine at an improper time, for example, when the feed member is pivoted so that its open front end extends toward the outside and the nail might then be propelled out of the feed channel, and possibly cause an injury to the operator of the machine, the invention further provides a safety device which is operatively associated with the end of the feed channel so as to lock the nail supply mechanism until the mouth

of the pivotable feed member at least partly engages into the driving channel within the nozzle of the machine.

A modification of the invention for attaining the same objects consists in designing the nozzle member of the machine so as to be partly retractable into the machine against the action of a spring before the machine can operate, and in providing this nozzle member with means which are operatively associated with the pivotable feed member so as to pivot the same out of the driving channel when the machine is pressed against an object to be nailed and the nozzle member is thereby pushed inwardly.

Instead of providing the retractable nozzle member with such means for pivoting the feed member out of the driving channel, the nozzle member may according to another modification of the invention also be provided with means for locking the feed member to prevent it from being pivoted out of the driving channel as long as the nozzle member is not pushed inwardly.

These and other additional objects, features, and advantages of the present invention will become more apparent from the following detailed description thereof, particularly when read with reference to the accompanying drawings, in which—

FIGURE 1 shows a central longitudinal cross section of the nailing machine according to the invention in the inoperative position;

FIGURE 2 shows a cross section similar to FIGURE 1 but only of the front part of the machine, and illustrates the various parts of the machine in the position in which they are disposed when the operating trigger is fully retracted, this section being taken, however, through the handle of the machine along a plane which is offset in a direction parallel to the central plane in which the section through the other parts is taken so as to disclose the valve members more clearly;

FIGURE 3 shows a cross section similar to FIGURE 2, but with the various parts in the position in which they are disposed when the operating trigger is only partly retracted;

FIGURES 4 and 5 show diagrammatically simplified cross sections of the nail feeding mechanism in two different operating positions;

FIGURES 6 and 7 show two cross sections similar to FIGURE 2, but illustrating a modification of the invention in two different operating positions; while

FIGURES 8 and 9 show two similar cross sections of a further modification of the invention in the same two operating positions.

Referring to the drawings, and first particularly to FIGURES 1 to 3, the pneumatic nailing machine according to the invention consists of an air cylinder, generally indicated by the numeral 1, which in the position as shown in FIGURE 1 has at its upper end a cylinder head, generally indicated at 2, and at its lower end a cylinder foot, generally indicated at 3. Air cylinder 1 consists of three tubular cylindrical members 4, 5 and 6 which are disposed coaxially within each other and surround a cylindrical chamber 7 forming the actual work chamber as well as two annular chambers 8 and 9 around work chamber 7 and coaxially thereto. Work chamber 7 contains a ram piston 10 which is slidable therein and carries on its lower end and integral therewith a striker pin 11, and on its upper end a stem 13 with an annular groove therein into which a pair of spring-loaded pins 12 are adapted to engage to arrest ram piston 10 and striker pin 11 in the fully retracted position. At its lower end, work chamber 7 communicates through apertures 14 in cylinder 4 with the annular chamber 8 which serves as an air-storage chamber. The upper part of work chamber 7 above piston 10 communicates through another aperture 15 in cylinder 4 and through a channel 16 in the cylinder head 2 with a pressure inlet valve consisting of a spring-loaded valve disk 17 which is adapted to close channel 16 from the annular chamber 9 which serves as

a channel for supplying compressed air to the upper part of work chamber 7 above piston 10. For this purpose, the annular chamber 9 communicates at its lower end with a channel 18 in cylinder foot 3 which may be connected in a conventional manner to a suitable source of compressed air, not shown.

The operation of valve disk 17 of the pressure inlet valve in cylinder head 2 will be controlled by a pneumatic control piston 19 which carries a pin 22 which is adapted to pass through a bore 20 in order to engage with a pin 21 on the lower side of valve disk 17. Since pin 22 has substantially the same diameter as bore 20 and the wall of this bore is additionally provided with a packing 20', pin 22 will close bore 20 tightly when passing into the same. A coil spring 23 surrounding pin 22 tends to maintain control piston 19 in its lowest position in its chamber 25, as illustrated in FIGURE 1, in which its pin 22 does not engage into bore 20 so that the upper part of work chamber 7 above ram piston 10 will then be vented by communicating with the outside through channel 16, bore 20, and a vent opening 24 in the wall of chamber 25. The lower part of chamber 25 containing control piston 19 communicates through a conduit 26 and a channel 27 in cylinder foot 3 with a release valve 28 which is provided for the pneumatic actuation of the mechanism consisting of control piston 19 and valve disk 17 for releasing and propelling ram piston 10 and striker pin 11 downwardly to carry out a power or nail-driving stroke.

Release valve 28 consists of a valve disk 31 which is normally held upon its seat 29 by the action of a coil spring 30 so as to shut off the connection between the pressure inlet channel 18 and channel 27 leading to piston chamber 25. Valve disk 31 has an actuating pin 32 thereon, the lower end of which projects toward the outside of cylinder foot 3 and is operatively associated with an actuating trigger 34 which is pivotable about a pin 33. The actuating pin 32 is also provided with a channel 35 which connects channel 27 with the outer atmosphere when trigger 34 is in its released position so that the compressed air remaining in piston chamber 25, conduit 26 and channel 27 after valve 28 has closed can escape which will permit control piston 19 to return to its original position as shown in FIGURE 1. If trigger 34 is actuated and pivoted in a clockwise direction about pin 33, a plug 36 of resilient material which is mounted on the trigger will close the outlet opening of channel 35.

Cylinder foot 3 further contains a nozzle member 38 with a channel 39 therein which forms the driving channel for receiving a nail 40. When ram piston 10 is propelled forwardly by the compressed air in chamber 7 above the piston, its striker pin 11 passes into driving channel 39 and drives nail 40 into a wall or other solid object 41 upon which the front end of nozzle 38 is rested. The nails are supplied into driving channel 39 through a feed channel 43 which consists of a curved tube or hose 42 in the handle of the machine in cylinder foot 3 and a curved tubular feed member 44 which is rigidly or integrally secured to trigger 34 and pivotable with the same about pin 33 within a slot 45 extending through the walls of cylinder foot 3 and driving channel 39 in nozzle 38. When trigger 34 is in the released position, as illustrated in FIGURE 1, the front end of feed member 44 passes through slot 45 into driving channel 39 and the entire feed channel 43, 44 has then a smooth substantially uniform curvature merging at its front end gradually and without any angularity into the driving channel 39. In order to maintain the front end of feed member 44 in a resilient engagement with the inside of driving channel 39 at a point diametrically opposite to slot 45 so as to insure that the front opening in feed member 44 will always be in the proper position relative to driving channel 39, the handle of cylinder foot 3 is provided with a cylindrical bore in which a small pneumatic piston 46 is slidable and pressed under the action of the compressed air

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in the inlet channel 18 against trigger 34. Piston 46 is preferably provided with a packing ring 47 in order to prevent any pressure leak from inlet channel 18. For preventing any interference of feed member 44 with striker pin 11 during its nail-driving stroke, the resilient plug 36 as shown in FIGURE 1 is mounted on trigger 34 at such a distance from the end of actuating pin 32 of valve 28 that this valve will not be actuated until feed member 44 has been pivoted entirely out of driving channel 39.

In the event that piston 10 should drop down accidentally, it will fall upon an abutment 48 on feed member 44 within driving channel 39 and facing toward striker pin 11, and the latter will thus be prevented from becoming wedged on the downwardly curved wall of feed member 44.

FIGURES 4 and 5 diagrammatically illustrate the nail feeding mechanism which essentially consists of a nail-receiving hopper 50 which is connected by a slide valve, generally indicated at 51, to the nail feed line 42 which, in turn, is connected to or integral with feed channel 43, 44 in the nailing machine. For dropping the nails 52 intermittently into hopper 50, a piston 53 is slidable under pneumatic pressure within a cylinder 65 in a horizontal direction and carries a rod 53' with a slide member 54 thereon which is thus moved relative to the end of a pair of feed rails 55 between which a continuous supply of nails is fed, for example, from a suitable assorting device of a known design, toward the end of rails 55 adjacent to slide member 54. Slide member 54 is provided with a suitable recess 57 which, when it is moved to the left in the manner as subsequently described, passes in front of the open end of slot 56 between rails 55 and then picks up a nail 52 from the end of slot 56. When rod 54 returns to its original position toward the right in FIGURE 4, it draws nail 52 into hopper 50 through a slot 58 in the wall thereof and drops the nail by gravity from recess 57 into hopper 50 as soon as the nail head has disengaged from the outer edge of the right rail 55.

The operation of the nail feeding mechanism is controlled by a valve, generally indicated at 60 in FIGURES 1 to 3, which is mounted within foot 3 of the machine and connected at one side through a channel 61 with the annular pressure supply channel 9 and at the other side through a channel 62 and a conduit or hose 63 with piston chamber 64 in control cylinder 65 containing the piston 53, as shown in FIGURES 4 and 5.

Valve 60 consists of a ball 67 which is normally adapted to shut off the connection between channels 61 and 62 by being pressed upon its seat by the compressed air coming from channel 61 and by the action of a coil spring 66. For lifting ball 67 from its seat against the pressure of spring 66 and the air pressure from channel 61, valve 60 contains a tappet 68, one end 68' of which projects into a chamber 39' which forms an extension of work chamber 7 in cylinder 4. When ram piston 10 moves downwardly and is near the end of its driving stroke, the lower reduced part thereof passes into chamber 39' and thereby pushes the projecting end 68' of tappet 68 toward the right, as seen in FIGURE 1, so that the latter pushes ball 67 off its valve seat. Thus, at the end of a complete driving stroke of ram piston 10 and striker pin 11, the pressure supply channel 18 will be connected with piston chamber 64 of control cylinder 65 through the annular channel 9, channel 61, valve 60, channel 62, and hose 63, so that the compressed air passing into chamber 64 will push piston 53 toward the left against the action of a spring 69, as shown in FIGURE 4. Piston rod 53' has a flat portion within cylinder 65 on which a pawl 71 with an inclined lower surface is eccentrically pivotable about a pin 70 in a counterclockwise direction from the position shown in FIGURE 4 which is determined by a stop pin 72. This pawl 71 is associated with a detent 76 on one arm 74 of a bell crank 74, 75 which extends into cylinder 65 through an aperture 77 in the wall thereof. During the forward movement of piston 53,

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that is, toward the left in FIGURE 4, by the action of the compressed air entering through hose 63 into piston chamber 64, bell crank 74, 75 will not be moved since pawl 71 then merely slides loosely over detent 76.

After striker pin 11 has penetrated into driving channel 39 in nozzle 38, the lower end of work chamber 7 will be shut off from the outer atmosphere, especially by a packing ring 96, so that the air in front of striker pin 11 will be forced into the annular chamber 8 and be compressed therein. As soon as trigger 34 is released and the supply of compressed air into chamber 7 above ram piston 10 is shut off, piston 10 is propelled back to its original position by the force of the compressed air in the annular chamber 8, and is again arrested in this position by the spring-loaded pins 12. During the first part of the return movement of piston 10, valve 60 will be closed so that the compressed air will be retained in channel 62, hose 63, and piston chamber 64, and piston 53 will remain in its extreme left position in which recess 57 in slide member 54 is disposed directly in front of slot 56 between rails 55 and thus receives a nail 52.

In order to actuate the nail feeding mechanism, it is first necessary to release the air pressure from piston chamber 64 in a manner as will be later described in detail. Under the action of a spring 69, piston 53 will then be able to move back to its original position, as shown in FIGURE 4. Slide member 54 will then draw nail 52 in recess 57 through slot 58 into hopper 50 and drop it into the latter and then into the nail feed conduit 42. During this return movement of piston 53, pawl 71 engages with detent 76 and pivots bell crank 74, 75 in a clockwise direction about its axis 73, as illustrated in FIGURE 5. Arm 75 of bell crank 74, 75 then acts upon the tappet of a valve disk 80 in a pressure inlet valve 81 so as to depress the same from its seat against the pressure of the compressed air supplied through a conduit 82 and against the action of a spring 83. Valve disk 80 is thus depressed from its seat, however, only for a short time since near the end of the return movement of piston 53, pawl 71 will slip off detent 76 so that bell crank 74, 75 can return to its original position under the action of spring 83 which also closes valve 81.

During this short length of time during which valve 81 is opened, a blast of compressed air passes through a channel 84 to the inside of a cylinder 85 in which it acts upon the face of a slide valve 86 which has a transverse bore 87. When slide valve 86 is in its inoperative position, as shown in FIGURE 4, this transverse bore 87 connects the hopper 50 with the nail feed conduit 42. In this inoperative position, slide valve 86 is pressed by a spring 88 against a stop pin 89 and thereby shuts off the opening 90 into a pressure conduit 91 which connects the inside of cylinder 85 with the nail conduit 42. When the blast of compressed air from valve 81 acts upon slide valve 86, as mentioned above, the latter is shifted toward the left, thereby first shutting off the connection of nail conduit 42 with hopper 50 and thus with the atmosphere, and then freeing the opening 90 into conduit 91 so that the blast of compressed air will pass into nail conduit 42, where it will act upon the nail which has previously been dropped into conduit or hose 42 so as to convey the same to the nailing machine and into driving channel 39 thereof.

However, as previously mentioned, this operation of the nail feeding mechanism at first requires a release of the pressure in piston chamber 64 so that spring 69 can return piston 53 to its original position. For this purpose, the pneumatic piston 46 which is slidable within the upper part of a bore 94 and is adapted to return trigger 34 and feed member 44 to their normal positions when the trigger is released also serves as a slide valve by being provided at the lower end of the reduced shaft portion 93 with a slide member 46' which, when trigger 34 is pulled back, closes a vent 92 leading to the outside from bore 94. Channel 62 which is connected by hose 63 with

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piston chamber 64 crosses bore 94 at a point intermediate piston 46 and slide member 46' and is thus connected through vent 92 with the atmosphere when trigger 34 is released and plug 36 separates from the actuating pin or tappet 32 of valve disk 31 and the opening of vent 35 in tappet 32. Thus, piston chamber 64 is also vented so that a new nail 52 may then be supplied through nail conduit 42 to driving channel 39. It will thus also be rendered impossible that a nail might be fed to the machine while feed member 44 is pivoted outwardly and that such a nail might be shot out of the open end of the pivoted feed member 44 and possibly cause serious damage or injury to the operator.

Since trigger 34 and feed member 44 are rigidly secured to each other, the actuation of trigger 34 also results in a pivotal movement of feed member 44 about its axis 33. At this operation, vent 92 of channel 62 will at first be closed by slide member 46' whereupon, when the free end of feed member 44 has been completely pivoted out of driving channel 39, valve 28 will be actuated so that ram piston 10 will be propelled to carry out a driving stroke. Striker pin 11 then hits upon a nail 40 which has been previously supplied into driving channel 39 and been gripped between jaws 97 which are compressed by a resilient ring 97'. When the driving stroke has been completed, the reduced lower end of ram piston 10 actuates valve 60 so that, after a nail 52 which has previously been picked up by recess 57 in slide member 54 has been dropped into hopper 50 and through bore 87 into nail conduit 42, piston 53 will again be pushed toward the left so that recess 57 in slide member 54 will again be moved directly in front of slot 56 to receive another nail. This condition remains as long as trigger 34 will be held in the retracted position. As soon as trigger 34 is released, it will be pivoted in a counterclockwise direction by the action of compressed air upon piston 46. Valve 28 will then close with the result that the ram piston 10 is propelled back to its starting position. Immediately thereafter, feed member 44 enters into driving channel 39. Shortly before trigger 34 and feed member 44 arrive in their original positions, vent 92 will be freed by slide member 46' so that the compressed air can escape from piston chamber 64 and the nail which is already dropped into nail conduit 42 will be conveyed to the machine and into driving channel 39.

If for some reason a nail 94 should rebound into feed member 44 or remain stuck in the open end thereof, as indicated in dotted lines in FIGURE 3, it will act as a lock and prevent any actuation of valve 28 by trigger 34. There is thus no air pressure to propel piston 10 with striker pin 11, and any wedging of the latter against the nail will be impossible. This result is at least partly due to the fact that the lower end of slot 45 is disposed closely adjacent to the end of feed member 44.

If, however, for some reason a nail should be caught entirely within feed member 44, it will drop out of it, as indicated at 95 in FIGURE 2, when trigger 34 is fully pulled back and feed member 44 is pivoted fully out of slot 45. Thus, striker pin 11 will carry out its stroke without any effect and also without causing any damage.

FIGURES 6 and 7 illustrate a modification of the invention which, however, corresponds in most respects with the embodiment according to FIGURES 1 to 5. Therefore, in order to avoid unnecessary repetition, those parts in the embodiment according to FIGURES 6 and 7 which are identical or similar to the parts shown in FIGURES 1 to 5 are indicated by reference numerals which are higher by one hundred than the numerals used for these parts in FIGURES 1 to 5.

The modification of the invention as illustrated in FIGURES 6 and 7 differs from the embodiment previously described primarily by the fact that the nozzle 138 of the nailing machine is slidable in the axial direction within foot 103 against the action of a spring 199. Nozzle 138 is connected to a cylindrical part 103' of foot 103 by means

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of at least one ball 198 which is disposed within a radial bore in the cylindrical part 103' and engages into a groove 138' in nozzle 138 which extends in the axial direction. Ball 198 is retained in this position by a ring 198' which has a slot coinciding with slot 145 in the cylindrical part 103' and is removably secured in this position by means of a locking device 198'' consisting of a ball and a spring.

The upper end of nozzle 138 has a downwardly inclined surface 200 engaging with at least one roller 149 which is rotatably mounted on feed member 144 which, in turn, is pivotable about the axis 133. Preferably two such rollers 149 are mounted at opposite sides of feed member 144 and are associated with a pair of opposite inclined surfaces 200 at the upper end of nozzle 138. These surfaces 200 are inclined at such an angle that, when nozzle 138 is pushed into the cylindrical part 103' against the action of spring 199, the inclined surface or surfaces 200 exert a cam action upon roller or rollers 149 so that feed member 144 is pivoted out of driving channel 139 through slot 145. Since the trigger 134 is rigidly secured to feed member 144, the pivotal movement of the feed member caused by the inward movement of nozzle 138 also results in a pivotal movement of trigger 134 so that the release valve 128 as well as the pneumatic slide member 146' will be actuated in the same manner as described with reference to FIGURES 1 to 5.

The operation of the nailing machine according to FIGURES 6 and 7 is briefly as follows:

For starting a driving stroke of the ram piston, the nailing machine is pressed with its nozzle 138 against the respective object 141 to be nailed. By such pressure, nozzle 138 is pushed into the cylindrical part 103' against the action of spring 199 and thereby, in turn, pivots feed member 144 out of the path of movement of striker pin 111 by means of the inclined end surfaces 200 and rollers 149, as illustrated in FIGURE 7. This results at the same time in a pivotal movement of trigger 134 about its axis 133, whereby the release valve 128 and slide valve 146' will be actuated in the same manner as described with reference to FIGURES 1 to 5.

Trigger 134 may also in this embodiment be made in the form of a finger-actuated trigger or, contrary to trigger 34 of the embodiment according to FIGURES 1 to 5, it may be disposed within the housing of the machine so as to be inaccessible from the outside, in which case the machine may be operated only by pushing the nozzle 138 inwardly.

FIGURES 8 and 9 illustrate a further modification of the embodiment of the invention according to FIGURES 1 to 5. The entire foot 301 of the machine, just like foot 103 of the embodiment according to FIGURES 6 and 7, may be easily exchanged for foot 3 of the machine according to FIGURE 1. This foot 301 is also provided with a separate tubular feed member 302 forming the extension of the nail feed conduit 42, 43 and rigidly secured to trigger 305 and pivotable about the axis 303 in a slot 304 of the foot.

Similar to the nailing machine according to FIGURES 6 and 7, the machine according to FIGURES 8 and 9 also has a nozzle 306 which is axially slidable within foot 301. However, while feed member 302 is actuated by the trigger 305 in the same manner as feed member 44 is actuated by trigger 34 in FIGURES 1 to 5, this machine is further provided with a locking device for preventing any pivotal movement of feed member 302 or actuation of trigger 305 while the machine is not in actual operation, that is, while nozzle 306 is not pressed against the object to be nailed. This locking device consists of a bell crank which has three arms 308, 309, and 310 and is pivotable about an axis 307. Arm 308 of this bell crank is provided with a projection or cam 311 which engages with the upper end surface 312 of nozzle 306. The second arm 310 is acted upon by a compression spring 313 which maintains cam 311 in constant engagement with end surface 312. The third arm 309 of the bell crank is provided with a pro-

jection 314 which is operatively associated with a projection 315 on feed member 302. When the machine is not in actual operation and nozzle 306 is not pressed against an object to be nailed and thus not pushed into foot 301, projection 314 on arm 309 is pivoted outwardly of and adjacent to projection 315 on feed member 302 so that, at an attempt to pull trigger 305, projection 315 on feed member 302 will abut against projection 314. Thus, in this position of the machine there is no possibility of any accidental actuation of the trigger or withdrawal of feed member 302 from the driving channel. As long as the machine is not pressed against an object to be nailed so as to push nozzle 306 into foot 301, as illustrated in FIGURE 8, the machine remains inoperative and the ram piston cannot carry out a power stroke. If, however, nozzle 306 is pushed into foot 301, as illustrated in FIGURE 9, bell crank 308, 309, 310 is pivoted in a counterclockwise direction so that projection 314 on arm 309 will be pivoted out of the path of movement of projection 315 on feed member 302 so that the latter may be pivoted about its axis 303 by the actuation of trigger 305 to start a driving stroke of the ram piston. The effect of spring 199 of the embodiment according to FIGURES 6 and 7 of maintaining the nozzle in the forwardly extended, inoperative position is carried out in the embodiment according to FIGURES 8 and 9 by spring 313 which presses cam 311 upon the upper end surface 312 of nozzle 306 and thereby pushes the latter forwardly.

Although our invention has been illustrated and described with reference to the preferred embodiments thereof, we wish to have it understood that it is in no way limited to the details of such embodiments, but is capable of numerous modifications within the scope of the appended claims.

Having thus fully disclosed our invention, what we claim is:

1. A pneumatic nailing machine comprising an air cylinder and a nozzle member having a driving channel therein, a ram piston with a striker pin thereon adapted to slide within said cylinder under the action of compressed air for driving a nail or the like into a wall or other object, a nail feed conduit in said machine entering said driving channel from one lateral side thereof for inserting a nail into said driving channel, said striker pin being adapted to drive said nail or the like inserted into said channel, said feed conduit having a pivoted end portion movable into and out of said driving channel when said striker pin is not within said driving channel.

2. A pneumatic nailing machine as defined in claim 1, in which the lateral wall of said driving channel has a slot therein extending in the axial direction of the channel and through said wall into said driving channel, said pivotable end portion of said feed conduit comprising a tubular feed member pivotably mounted on said machine within said slot so that the open front end thereof is pivotable into and out of said driving channel.

3. A pneumatic nailing machine as defined in claim 2, in which said tubular feed member has a gradual curvature gradually merging into said driving channel.

4. A pneumatic nailing machine as defined in claim 2, in which the channel within said tubular feed member remains in direct communication with the channel in said feed conduit in any of the different pivoted positions of said tubular member, and further comprising a mechanism within said machine controlling the operation of said ram piston, and a trigger member for actuating said mechanism, said trigger member being connected with said tubular member so that the pivotal movement of one of said members will effect a pivotal movement of the other member.

5. A pneumatic nailing machine as defined in claim 4, in which said tubular feed member and said trigger member are rigidly secured to each other and pivotable about a common axis.

6. A pneumatic nailing machine as defined in claim 4,

further including means for connecting said trigger member with said controlling mechanism, said last-mentioned means having sufficient clearance from said trigger member so that said trigger member will not connect with and actuate said controlling mechanism until said tubular member has been pivoted completely out of said driving channel.

7. A pneumatic nailing machine as defined in claim 4, in which said controlling mechanism comprises a valve having a tappet spaced from said trigger member when in the released position at a distance substantially corresponding to the distance required for pivoting said trigger member so as to pivot said tubular member completely out of said driving channel.

8. A pneumatic nailing machine as defined in claim 4 in combination with a nail feeding mechanism for supplying one nail at a time to said machine, and means actuated by said tubular feed member for preventing the operation of said feeding mechanism until said feed member moves at least to some extent into said driving channel.

9. A pneumatic nailing machine as defined in claim 8, in which said feeding mechanism comprises pneumatically operated sliding means for picking up a nail from a supply, a nail feed supply conduit connecting said mechanism with said feed conduit in said machine, control means in said machine including a compressed-air conduit connecting said machine with said mechanism for supplying compressed air to said pick-up means to operate the same to pick up said nail and for arresting said pick-up means in the pick-up position, a vent for said compressed air conduit, a slide valve within said vent for controlling release of compressed air from said air conduit and thereby controlling return of said pick-up means to the original position and the taking along and automatically dropping of said nail into said nail feed conduit, valve means controlled by said pick-up means for then sending a blast of compressed air into said nail feed conduit to convey said nail to said machine and through said feed conduit in said machine into said driving channel, said slide valve being actuated by said trigger member so as to close said vent and thereby arrest said pick-up means in said pick-up position, while said starting mechanism is being actuated.

10. A pneumatic nailing machine as defined in claim 4, in which said slot in which said feed member is mounted terminates at a point adjacent to the open end of said feed member so that a nail which has only partly entered into said driving channel and partly remains within said feed member will prevent said feed member from being pivoted entirely out of said driving channel and will thereby prevent said starting mechanism from being actuated.

11. A pneumatic nailing machine as defined in claim 2, further comprising a pneumatic piston in said machine operated by compressed air for pivoting said feed member into said driving chamber.

12. A pneumatic nailing machine as defined in claim 11, further comprising a pneumatic piston in said machine operated by compressed air for pivoting said feed member into said driving chamber.

13. A pneumatic nailing machine as defined in claim 12, wherein said pneumatic piston and said slide valve are formed by two parts of a single element arranged within said vent.

14. A pneumatic nailing machine as defined in claim 2, further comprising a spring, said nozzle member being slidable in the axial direction into said machine against the action of said spring, and means for pivoting said feed member out of said driving channel when said nozzle is pushed into said machine.

15. A pneumatic nailing machine as defined in claim 14, in which said last-mentioned pivoting means comprise a surface on said nozzle extending at an oblique angle to the longitudinal axis of said cylinder and said

nozzle, and at least one roller rotatably mounted on said feed member and engaging with said surface.

16. A pneumatic nailing machine as defined in claim 2, further comprising a spring, said nozzle member being slidable in the axial direction into said machine against the action of said spring, and locking means for preventing said feed member from pivoting out of said driving channel as long as said nozzle member is not pushed into said machine.

17. A pneumatic nailing machine as defined in claim 16, in which said locking means comprise a bell crank pivotably mounted in said machine and having one arm engaging with a part of said nozzle member, and another arm forming a stop member for preventing said feed member from pivoting out of said driving channel as long as said nozzle member is not pushed into said machine and as long as said first arm is not pivoted by said nozzle member, said spring acting upon said bell crank to press said first arm into engagement with said part of said nozzle member and thus to maintain said nozzle member in the outwardly extended position.

18. A pneumatic nailing machine as defined in claim 2, in which said feed member is pivotably mounted in said slot in such a position that the end portion of said feed member when pivoted to its outermost position, will travel to such an extent that the open end of said feed member extends entirely outwardly of said machine.

19. A pneumatic nailing machine as defined in claim 2, in which said feed member is provided with a projection adapted, when said feed member is pivoted into said driving channel, to serve as an abutment for receiving said striker pin in the event that said ram piston should be accidentally released from its starting position.

20. A pneumatic nailing machine as defined in claim 2, in which said nozzle member partly extends into said cylinder, further comprising means for removably securing said nozzle member to said cylinder, said last means comprising a ring, said cylinder having at least one aperture therein, said nozzle member having at least one recess, a ball disposed with said aperture and engaging into said recess, said ring being rotatably mounted on said cylinder for closing said aperture toward the outside and thereby retaining said ball in said aperture, said ring having a slot which coincides with said slot in said driving channel when said ring is turned to one position, and resilient means for arresting said ring in said position.

21. A pneumatic nailing machine comprising an air cylinder, a nozzle member thereon, said nozzle member having a driving channel therein, a ram piston including a striker pin movable within said cylinder under the action of compressed air for driving a nail or the like into a wall or other object, a feed means for inserting a nail into said driving channel including an end portion movable into different positions, said end portion entering into said driving channel from one lateral side thereof in at least one of said positions, said striker pin being adapted to enter into said driving channel during the driving stroke of said piston and to act upon said nail or the like inserted into said channel, and means for moving said end portion of said feed means into said driving channel when said striker pin is not therein.

22. A pneumatic nailing machine as defined in claim 21, wherein said feed means includes a tubular feed conduit,

and means for pivotally mounting the front end portion of said tubular member for pivotal movement into and out of said driving channel, said front end portion constituting the end portion of said feed means movable into said driving channel, and wherein when the front end portion of said tubular feed conduit is pivoted into said driving channel, said feed conduit and the front end portion thereof have a gradual curvature which merges into said driving channel to form a single arc of entry for said nail.

23. A nailing machine for driving nails or the like into a wall or other object comprising a ram piston, means for guiding said ram piston, means for moving said ram piston along said guiding means for a driving stroke and a back movement, a nozzle member having a driving channel therein, a nail feed conduit entering said driving channel from a lateral side thereof for inserting a nail or the like into said driving channel, said ram piston having at least one end part thereof extending into the driving channel at the end of the driving stroke for driving said nail or the like out of the driving channel into the wall or other object, said feed conduit having a movably mounted end portion, means for moving said end portion into and out of said driving channel, a mechanism for actuating said moving means for said ram piston for starting a driving stroke of said ram piston, a trigger member movable into an actuating position for actuating said mechanism, said trigger member and said end portion of said nail feed conduit being connected for simultaneous movement during at least a part of their movement, and said actuating position of said trigger member being coordinated to stand out-of-said-driving-channel-position of said end portion of said nail feed conduit.

24. A pneumatic nailing machine comprising an air cylinder and a nozzle member having a driving channel, a ram piston with a striker pin thereon adapted to slide within said cylinder, means for moving said piston within said cylinder comprising a source of compressed air and conduit means connecting said source to said cylinder, a nail feed conduit in said machine for inserting a nail into said driving channel, said striker pin entering into said driving channel during the driving stroke of said piston so as to act upon said nail or the like inserted into said channel, said feed conduit having a pivoted end portion movable into and out of said driving channel from one lateral side thereof, a valve for closing and opening said compressed air conduit, a trigger member movable into an actuating position for opening said valve, said trigger member and said end portion of said nail feed conduit being connected for simultaneous movement during at least a part of their movements, and said actuating position of said trigger member being coordinated to said out-of-said-driving-channel-position of said end portion of said nail feed conduit.

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