

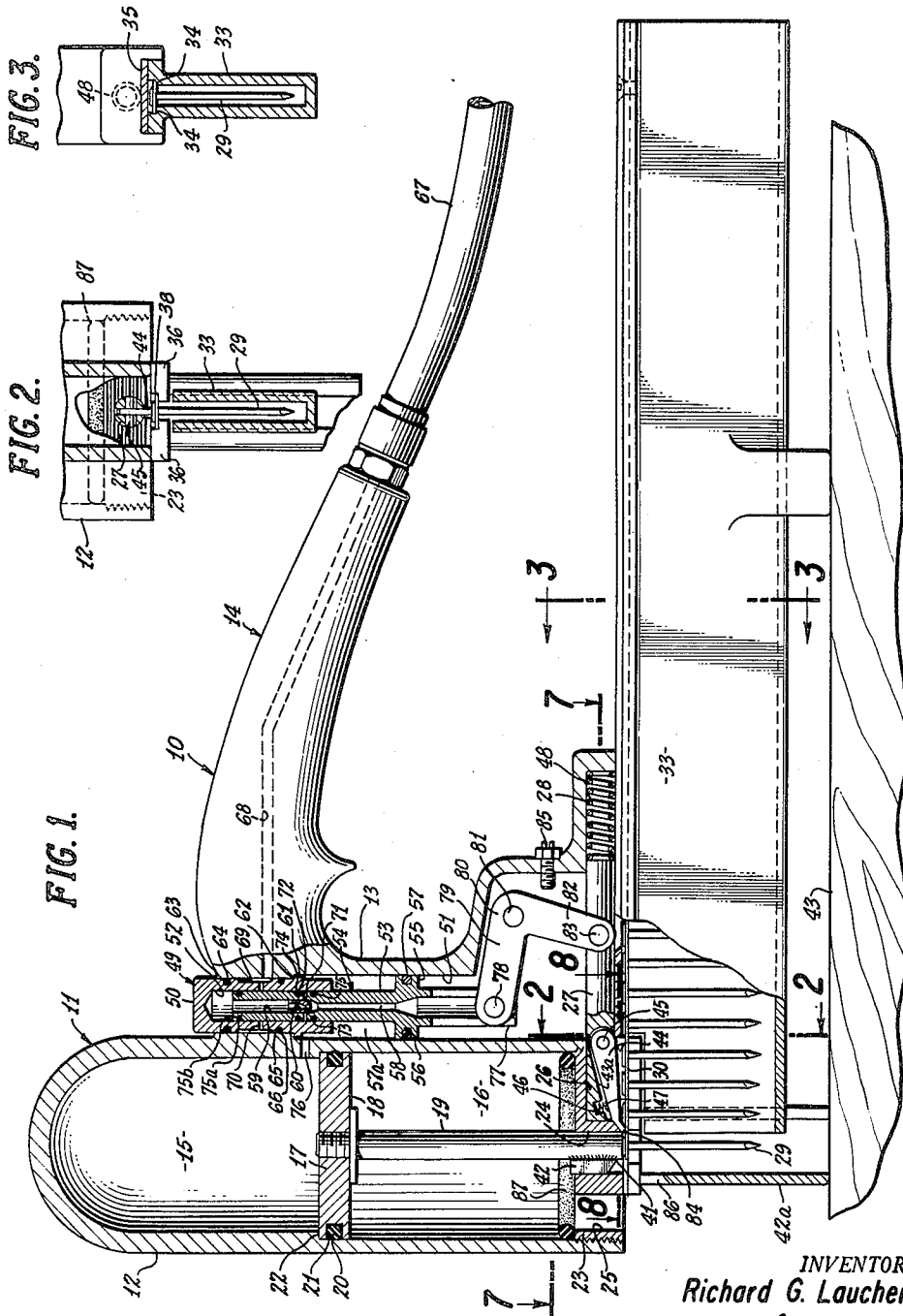
Feb. 9, 1960

R. G. LAUCHER
AUTOMATIC NAIL GUN

2,923,937

Filed May 3, 1956

2 Sheets-Sheet 1



INVENTOR,
Richard G. Laucher.
BY *R. E. Grogue*
ATTORNEY.

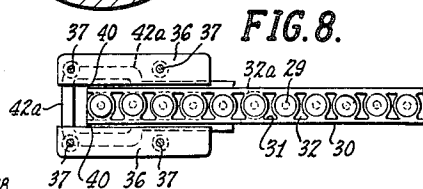
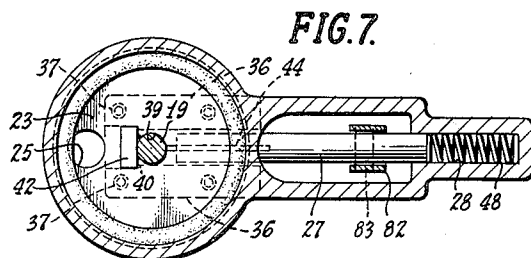
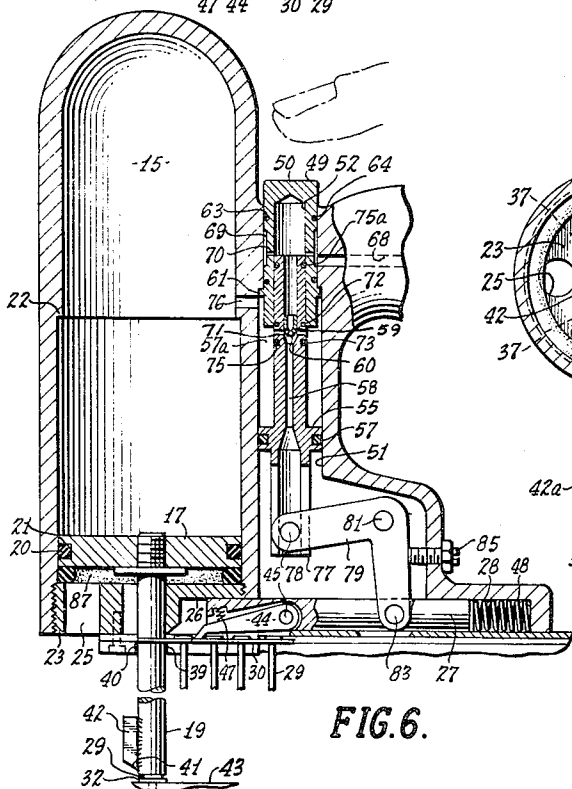
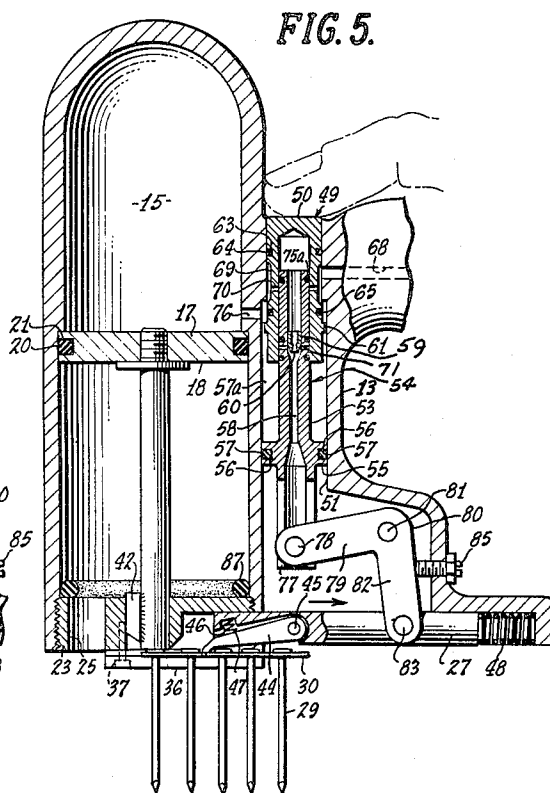
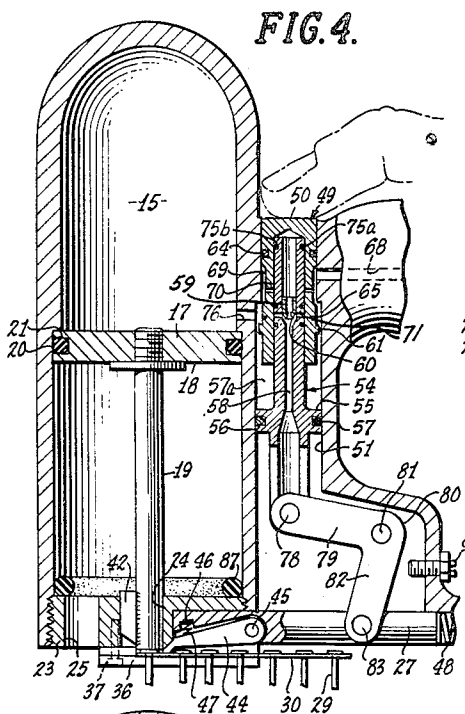
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INVENTOR,
Richard G. Laucher.
BY
R. E. Jeangue
ATTORNEY.

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AUTOMATIC NAIL GUN

Richard G. Laucher, Canoga Park, Calif.

Application May 3, 1956, Serial No. 582,358

17 Claims. (Cl. 1—44.4)

The present invention relates to a fluid responsive single-action cylinder or motor with associated valve control mechanism and more specifically to an air responsive automatic nail gun.

Prior mechanisms of this type for driving nails have been unwieldy and excessively heavy which has had a tendency to minimize their use as a portable tool. Also in certain instances they have been designed so that the hammer rod works against the compressive force of a spring when moving from its at rest to its hammering position so that the compressive force of the spring can be utilized for urging the hammer rod to resume its at rest position. It will be appreciated that in a design of this type the full weight of the hammer rod cannot be utilized for driving the nail. Other designs utilize a double-action cylinder for moving the hammer rod from its at rest to its nail driving position. It will be appreciated, however, that it is extremely difficult to get the desired rapid movement of the piston and that the inlet and outlet openings into the piston as well as the valve mechanisms must be extremely large to effect the rapid movement of the hammer rod to the extent desired. The automatic nail gun of the present invention utilizes the inertia or kinetic energy of a mass moving at high speeds for driving a nail into a supporting surface. Through the utilization of this principle the tool of applicant's invention is approximately only 3 pounds in weight and tends to move only a minimum amount off the work surface during the nail driving operation.

It is, therefore, a primary object of the present invention to generally improve the operation and construction of mechanisms of this type.

A further object of the present invention is to provide a nail gun wherein storage and release of compressed air is accomplished by using the shearing force required to shear the ribbon of the ribbon mounted nail.

Another object of the present invention is to provide a valve mechanism for directing air into a pressure chamber and for evacuating the air therefrom.

A still further object of the present invention is to provide a valve mechanism for driving a hammer rod in a nail driving direction and for indexing a plurality of ribbon-connected nails into driving relationship with respect to the hammer rod.

Yet another object of the present invention is to provide a mechanism of this type which is relatively light in weight, which is relatively simple in design and which can be easily and economically manufactured.

Further objects and advantages will become readily apparent to those skilled in the art upon perusal of the following description and drawings, in which:

Fig. 1 is a side elevational view of a nail gun embodying the principles of the present invention, with parts broken away to show details in construction.

Fig. 2 is a vertical sectional view taken on the line 2—2 of Fig. 1, with parts broken away.

Fig. 3 is a vertical sectional view taken on the line 3—3 of Fig. 1, with parts broken away.

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Figs. 4, 5 and 6 are views similar to Fig. 1, with parts broken away, showing actuation of the valve mechanism and movement of the hammer rod from its at rest position to its hammering position.

Fig. 7 is a cross-sectional view taken on the line 7—7 of Fig. 1.

Fig. 8 is a horizontal sectional view taken on the line 8—8 of Fig. 1.

Referring to Fig. 1 of the drawings, the principles of the present invention are shown as applied to an air driven automatic nail gun 10 which broadly consists of a housing 11 which comprises a cylinder portion 12, a valve housing portion 13, and a suitable handle 14. The housing is preferably cast of any suitable light material such as for instance aluminum and comprises a closed end pressure chamber 15 and an open end cylinder 16, each of these being coaxially aligned. A piston 17 is slidably received in the cylinder 16 and consists of a piston head 18 and a hammer rod 19 coaxially threadedly received by the piston head, a suitable seal 20 being received in an annular groove 21 formed on the circumferential surface of the piston head 18 for well known purposes. The upward travel of the piston 17 in the cylinder 16 is limited by a stop or shoulder 22 formed adjacent the upper circumferential edge of the cylinder 16, and as will be readily understood and more fully explained hereinafter, the hammer rod 19 is movable in a nail driving direction in response to pressure delivered into the pressure chamber 15.

The open end of the cylinder 16 threadedly receives a suitable end plate 23 and an axial opening 24 is formed in the end plate for receiving the end of the hammer rod 19 and for permitting the hammer rod to pass therethrough. The end plate 23 also has an air opening 25 formed therein for connecting the cylinder 16 with the atmosphere, and an opening 26 for slidably receiving one end of an index rod 27, the other end of the index rod being received in an opening 28 formed in the base of the valve housing portion 13 so that the index rod 27 is slidable in a direction substantially normal to the axis of the hammer rod.

A plurality of nails 29 are received in a nail strip 30 which is preferably formed of sheet metal such as for instance low carbon steel. The nail strip 30 is in the form of a ribbon and is formed with alternating index grooves 31 and nail head washers 32, the nail head washers being suitably apertured so as to support the nails, which are welded therein, in a downwardly depending direction, see Fig. 8. The nail strip or ribbon 30 is slidably carried in a nail cartridge 33, see Figs. 2 and 3, which is substantially U-shaped in cross section and can be formed as an extrusion of any suitable material or as a stamping. The cartridge provides a pair of supporting surfaces 34 for supporting the opposite edges of the nail ribbon for indexed movement, and a suitable cover 35 is provided for enclosing the nails and nail ribbon in the cartridge. The cartridge 33 is suitably releasably attached in any conventional or preferred manner with the valve portion housing 13 so as to be in nail-feeding relationship to the hammer rod 19 as will be more fully appreciated hereinafter.

Referring particularly to Figs. 2 and 7, a pair of shear plates 36 are fixed by suitable screws 37 to the bottom surface of end plate 23 in spaced apart relationship so as to provide a groove 38 for permitting indexed movement of the nails to the hammer rod, a circular opening 39 for passage of the hammer rod 19 therebetween and defining a shear edge for cooperation with the end of the hammer rod and a pair of oppositely aligned shear edges 40 connecting with opening 39 for cooperation with a shear edge 41 of a knife 42 suitably fixed to the end

of the hammer rod 19 and movable in an opening in plate 23.

The opening 39 is sufficient to allow the nail head washer 32 to pass therethrough when the hammer rod is urged against the nail head with a force sufficient to shear the washer 32 from the ribbon 30 as will be more fully appreciated hereinafter. Upon initial movement of the rod 19, the end of the rod will shear the portion 32a connecting the washer with the side of the ribbon 30. After initial movement of the rod, the knife 42 will cooperate with the straight shear edges 40 in order to cut off the ends of the ribbon from which the previous washer has been cut. The discharge end of the nail cartridge has fixed thereto a protective tubular shield 42a for enclosing the nail 29 being driven into a supporting surface 43 and the hammer rod 19 when the gun is in operation.

The end of the index rod slidably received in the piston plate has a radial opening or groove 43a formed therein and an index pawl 44 is swingably supported therein by a suitably pivot pin 45. A spring seat 46 is so located that the compressive force of a spring 47 urges the pawl 44 to move into engaging relationship with respect to the index grooves 31 formed in the nail ribbon 30 so that axial movement of the index rod to the left, as viewed in Fig. 1, will move the nail ribbon in a like direction relative to the nail cartridge. The compressive force of a coiled spring 48 urges the index rod to move to the left and when the index rod has traveled to the end of opening 26 the foremost nail of the nail ribbon is located immediately below the hammer rod.

As previously suggested, a valve mechanism 49 is provided for automatically indexing the nail ribbon and for driving the hammer rod and the nail in a nail engaging position with respect to the supporting surface. The valve mechanism in the present instance comprises a gun trigger 50 which is in the form of a piston and which is slidably received in a cylindrical opening 51 formed in the valve housing portion 13. The gun trigger 50 has an axial opening 52 formed therein which receives the shank 53 of an ejector piston assembly 54. The ejector piston 54 has a piston head 55 which is slidable on the walls of the cylindrical opening 51 and an annular groove 56 formed therein for receiving a suitable seal 57 for well known purposes. The cylindrical opening 51 adjacent the face of the piston head 55 is in the form of a pressure chamber 57a wherein sufficient air pressure is directed to react against the head 55 to urge the ejector piston 54 to move in an indexing direction. The ejector piston 54 also has an axial opening 58 and a nozzle 59 located therein with an orifice opening 60 therethrough. The circumferential surface of the gun trigger or piston 50 has an annular ring 61 which moves into abutting relationship with respect to a shoulder 62 formed on the inner circumferential surface of the cylindrical opening 51 so as to limit upward movement of the trigger relative to the opening. The trigger also has an annular groove 63 for receiving a suitable O-ring or seal 64 adjacent the upward end thereof and an annular groove 65 for receiving a ring or seal 66 adjacent the annular ring 61.

The handle 14 is suitably connected to an air hose 67 which in turn is connected with a source of compressed air, and an opening 68 is formed in the handle which opens into the cylindrical opening 51 adjacent an annular groove 69 formed on the circumferential surface of the trigger 50. A pair of cross ports 70 lead from the annular groove 69 and open into the axial opening 52 of the trigger. A pair of cross ports 71 are also formed in the shank 53 of the ejector piston 54 adjacent the outlet opening of the nozzle 59 and a pair of O-rings 72 and 73 are received in annular grooves 74 and 75 formed on opposite sides of these cross ports 71. A seal 75a is also located adjacent the upper end of shank 53 in an annular groove 75b.

The pressure chamber 15 is interconnected with the cylindrical opening 51 adjacent the piston stop 22 by a port 76 so that compressed air can be directed into the pressure chamber for actuating piston 17 in a manner which will be fully described hereinafter, and the ejector piston assembly 54 has a downwardly extending tubular leg portion 77 which is pivotally connected by a suitable pin 78 to one leg 79 of a bell crank 80. The bell crank 80 is mounted so as to rock about the axis of a suitable supporting pin 81 carried by the valve portion housing 13 and the other leg 82 of the bell crank 80 is pivotally connected by means of a suitable pin 83 to the index rod 27 so that the index rod will be urged to move against the force exerted by the coiled compression spring 48 in response to downward movement of the ejector piston assembly 54. It will be appreciated that the pawl 44 is so designed that its engageable end hook 84 will be caused to move to the right over the nail head and the nail ribbon upon movement of the piston rod to the right. Since the nail gun is designed so as to drive only one nail at a time, it is necessary to provide means in the path of travel of said hammer rod whereby only one nail will be indexed to move into driving relationship with respect to the hammer rod after each nailing operation has been completed and this is effected by a screw 85 which is positioned in abutting relationship to the leg 82 of the bell crank 80 so as to limit the rocking of the bell crank in this direction to a predetermined extent so as to permit the index rod to move to the right a distance only sufficient to move the hook of the pawl into the index groove of the follow-up nail.

As previously suggested, the basic principle of applicant's automatic nail gun is based on the inertia of a piston moving at high speeds and this inertia being transmitted into work to drive a nail into a supporting surface. In the operation of the gun, compressed air, approximately 90 to 100 p.s.i., is supplied to the valve mechanism 49 by way of hose 67 and port or opening 68. In the normal non-activated position of the gun trigger 50, the valve mechanism and the piston 17 assumes the position shown in Fig. 1 and the compressed air entering the annular groove 69 is completely trapped by O-rings or seals 64, 65, 72 and 75a which form a seal against movement of the air into the valve and consequently holds the air at line pressure. When the trigger 50 is activated downwardly by the operator (see Fig. 4) the compressed air passes downwardly into pressure chamber 57a and into pressure chamber 15 by way of opening 76 wherein it acts against the face of piston head 18. It will also be appreciated that the pressure of the compressed air also reacts against the piston head 55 of the ejector piston 54. Since the compressed air can only enter the piston chambers 15 and 57a, the force exerted against the face of piston head 55 of the ejector piston is built up to a point sufficient to urge the ejector piston 54 to move downwardly a distance sufficient to rock the bell crank 80 against the limit screw 85, which in turn as previously suggested, moves or indexes the tooth 84 of the pawl 44 from its engagement with the index groove 31 between the first and second nail to engagement with the index groove between the second and third nail (see Fig. 5). Concurrently with this, the air pressure in the chamber 15 builds up to exert sufficient force on the face of the piston head 18 to urge the hammer rod 19 against the head of the nail located in nail driving position with respect to the hammer rod to hold the strip 30 during indexing of pawl 44 and until the nail head washer 32 is sheared from the nail strip (see Fig. 6). The nail 29 and its washer 32 are consequently released with the hammer rod 19 and the piston head 18. It will be appreciated that the stored energy in the pressure chamber 15 prior to the shearing action of the washer head 32 from the rest of the ribbon 30 is sufficient after the shearing action has taken place to drive the piston 17 and the nail 29 as a rapidly ac-

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celerating mass against the supporting surface to be nailed. During movement of the hammer rod 19 downwardly, the shearing edge 41 of the knife 42 contacts the nail ribbon 30 and shears off the end strip. An opening 86 is formed in shield 42a for permitting the end strip to be discharged out of the shield.

As previously suggested the inertia of the mass of the piston head 18, the hammer rod 19 and the nail 29 builds up during travel from the at rest position to the contact of the nail with the supporting surface to be nailed because of the sudden release of energy in the pressure chamber 15. Since the kinetic energy of this rapidly moving mass is utilized for driving the nail into the supporting surface the piston can be made of relatively light material and of light construction and the gun can also be made relatively light in weight. It will also be appreciated that by reason of this, a light gun can be utilized for driving nails which will move only a minimum amount off the work surface while in operation and which in turn minimizes fatigue of the operator.

After the hammer stroke or nailing operation is completed, the operator releases the trigger 50 thereby opening the cross ports 71 to the pressure chambers 15 and 57a (see Figure 6). In addition, the cross ports 70 are opened so as to direct compressed air into the orifice opening 60 of the nozzle 59. It will be appreciated that the compressed air passing through the orifice opening 60 of the nozzle 59 acts as a pump and draws the air in the pressure chamber 15 through the cross port 71 and into the atmosphere through passage 58. A low pressure vacuum therefore is developed in the pressure chamber 15 and the piston head 18 is urged into its at rest position against limit stop 22 by atmospheric pressure acting against the bottom face thereof and entering through opening 25 of the end plate 23. The pressure differential therefore between the pressure chamber 15 and the atmosphere returns the piston to its at rest position.

The pressure chamber 57a is also evacuated by the pumping action of the nozzle so that the pressure differential between this chamber and the atmosphere as well as the force exerted by spring 48 urges the ejector piston 54 to once again resume its raised position as shown in Fig. 1 after the end of hammer rod 19 has been returned to its initial position above the strip 30. This in turn causes the bell crank 80 to be rocked so as to urge the index rod to move to the left, the pawl indexing the follow-up nail into nail driving relationship with respect to the hammer rod. It will be appreciated, therefore, that the hammer has once again resumed its at rest position and that the ejector piston has once again resumed its non-activated position wherein the seals 64, 65, 72 and 75a act to trap the air at line pressure. It is understood that the lower part of housing portion 13 is connected to atmosphere by suitable openings to discharge the air from opening 58.

An O-ring 87 is located adjacent the inner face of end plate 23 for absorbing the shock of piston head 18 when the same is urged to move in its hammering direction.

It is apparent that the product of pressure stored in chamber 15 and the area of piston 17 determine the shearing force of the piston and that the volume of chamber 15 for a given chamber pressure represents the potential energy convertible to kinetic energy. Thus, the volume of chamber 15 can be varied to provide sufficient driving force for various sizes of nails, assuming that the same strip is used.

The present invention utilizes the strip 30 to hold back the piston 17 until sufficient potential energy is present in chamber 15. This energy builds up relatively slowly through the line and valve restrictions. If this holding action were not present, the piston would start to move the nail immediately upon admission of fluid pressure

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to chamber 15 and after the nail engaged surface 43, the nail gun would be bodily moved away from the surface 43 since the reaction energy of the light gun is less than the energy required to drive the nail.

The composition, thickness and shear length of the strip portion 32a determine the shear force required to free the washer 32 and nail 29 from the strip and it is apparent that a suitable strip can be selected for any given nail gun or that a suitable piston area, chamber volume and line pressure can be selected for a nail gun to utilize any given strip construction.

The fluid motor of the present invention, comprising the valve mechanism and piston assembly, can be utilized for various other one directional load systems, such as for air clamps, and the ejector return of the piston assembly provides for quick return. The ejector return has the advantage that the fluid motor is operated in both directions through a single cylinder port by a prime pressure source. By utilizing the ejector return, a large opening 25 can be utilized to subject one side of piston head 18 to atmosphere so that pressure will not build up against the piston head on its work stroke. With double action pistons, large valving mechanism would be required to control the exhaust and entrance of fluid pressure through such a large opening. It is further understood that the normal distance between the end of nail 29 and the work surface is sufficient to permit the light piston assembly to accelerate and transfer the potential energy in chamber 15 to kinetic energy of the light piston.

Various modifications are contemplated by those skilled in the art without departing from the spirit and scope of the invention as hereinafter defined by the appended claims.

What is claimed is:

1. An automatic nail gun for driving a ribbon connected nail into a work surface comprising a hammer rod movable from an at rest position to a hammer position, an indexing mechanism biased to move in one direction for urging said ribbon to move into the path of travel of said hammer rod sufficiently to locate said nail in driving relationship with respect to said hammer rod when said hammer rod is in its at rest position and in elevated position with respect to said work surface, and means for directing fluid pressure against said hammer rod for urging said hammer rod to move in its hammering direction and for moving said indexing mechanism to move in the other direction a predetermined distance, the fluid pressure directed against said hammer rod being stored until sufficient to cause said hammer rod to shear said ribbon and permit conversion of potential energy of the fluid pressure to kinetic energy of said hammer rod and said nail.

2. A nail gun for a ribbon connected nail comprising a fluid responsive single action motor including a piston having a hammer rod movable from an at rest position to a work position and a housing for slidably receiving said piston, means for slidably carrying said ribbon across the path of travel of said hammer rod for positioning said nail adjacent the striking head of said hammer rod when said hammer rod is in its at rest position and in an elevated position relative to a work surface, and means for directing fluid pressure into said housing for urging said hammer rod to move in a work direction, said ribbon resisting movement of said hammer rod from its at rest position until the pressure has built up sufficiently to cause said hammer rod to shear said ribbon, whereby the sudden release of the stored energy in said housing causes rapid acceleration of said piston and nail in a work direction for driving said nail into said work surface, said last mentioned means including further means operable after the nailing operation for creating a vacuum in said housing for causing said piston to resume its at rest position.

3. A nail gun for ribbon connected nails comprising

a fluid responsive single action motor including a piston having a hammer rod movable from an at rest position to a work position and a housing for slidably receiving said piston, means for slidably carrying said ribbon across the path of travel of said hammer rod for positioning a nail adjacent the striking head of said hammer rod when said hammer rod is in its at rest position and in an elevated position relative to a work surface, a valve for directing fluid pressure into said housing for urging said hammer rod to move in a work direction, said ribbon resisting movement of said hammer rod from its at rest position until the pressure is built up sufficiently to cause said hammer rod to shear said ribbon, whereby the sudden release of the stored energy in said housing causes rapid acceleration of said piston and nail in a work direction for driving said nail into said work surface, and index means controlled by said valve for moving the follow-up nail in driving alignment with said hammer rod upon said hammer rod resuming its at rest position.

4. A single-action fluid responsive motor for exerting a work force in one direction, a valve for controlling said work force comprising a housing having a cylindrical opening formed therein and a pressure chamber co-axial with said opening and interconnected with said motor, a trigger slidably received in said opening and movable from a normal non-activated position to an actuating position, an ejector piston slidably received in said pressure chamber and having a shank telescopically received by said trigger, said housing having a duct for directing fluid pressure into said opening, seal means for sealing said duct at line pressure upon said trigger being in its normal position, said fluid pressure being directed into said pressure chamber for urging said piston to move in one direction and into said motor for causing said motor to exert said work force upon said trigger assuming its actuating position relative to said ejector piston, said piston being tubular in form and said fluid pressure being directed through said piston upon said trigger resuming its normal position and said shank having a cross port which moves into an unsealed position whereby said fluid pressure in said pressure chamber and in said motor is evacuated through said piston and said piston is urged to move relative to said trigger into its normal position and said motor is caused to resume its normal non-activated position.

5. A single-action fluid responsive motor for exerting a work force in one direction, a valve for controlling said work force comprising a housing having a cylindrical opening formed therein and a pressure chamber co-axial with said opening and interconnected with said motor, a trigger slidably received in said opening and movable from a normal non-activated position to an actuating position, an ejector piston slidably received in said pressure chamber and having a shank telescopically received by said trigger, said housing having a duct for directing fluid pressure into said opening, seal means for sealing said duct at line pressure upon said trigger being in its normal position, said fluid pressure being directed into said pressure chamber for urging said piston to move in one direction and into said motor for causing said motor to exert said work force upon said trigger assuming its actuating position relative to said ejector piston, said piston being tubular in form and having a nozzle located therein and said fluid pressure being directed through said nozzle upon said trigger resuming its normal position and said shank having a cross port adjacent said nozzle which moves into an unsealed position whereby said fluid pressure in said pressure chamber and in said motor is evacuated through said piston and said piston is urged to move relative to said trigger into its normal position and said motor is caused to resume its normal non-activated position, and force transmitting means connected with said piston for exerting a predetermined force in timed relationship with respect to said work force.

6. A single-action fluid responsive motor for exerting a work force in one direction, a valve for controlling said work force comprising a housing, a trigger slidably received in said housing and movable from a normal to an actuated position, said trigger having an axial opening formed therein, an ejector piston slidably received in said housing and having a shank slidably received by said trigger, means for directing fluid pressure into said housing adjacent said trigger, means for sealing said fluid at line pressure when said trigger is in its normal position, said fluid pressure being directed into said motor for causing said motor to exert said work force when said trigger is moved axially in said housing relative to said shank into its actuated position, said fluid pressure reacting against said ejector piston to cause said piston to move axially relative to said trigger, said ejector piston having formed therein a discharge opening and said trigger upon resuming its normal position having a port for directing fluid pressure through said discharge opening and said shank having a port for interconnecting said motor with said discharge opening for creating a vacuum by ejection action in said motor.

7. A single action fluid responsive motor for exerting a work force in one direction, a valve for controlling said work force comprising a housing, a trigger slidably received in said housing and movable from a normal to an actuated position, said trigger having an axial opening formed therein, an ejector piston slidably received in said housing and having a shank slidably received in said trigger, means for directing fluid pressure into said housing adjacent said trigger, means for sealing said fluid at line pressure when said trigger is in its normal position, said fluid pressure being directed into said motor for causing said motor to exert said work force when said trigger is moved axially in said housing relative to said shank into its actuated position, said fluid pressure reacting against said ejector piston to cause said piston to move axially relative to said trigger, said ejector piston having formed therein a discharge opening with a nozzle located therein and said trigger having a port for directing fluid pressure through said nozzle upon resuming its normal position and said shank having a port located adjacent said nozzle for interconnecting said motor with said discharge opening for creating a vacuum by ejection pumping action in said motor.

8. A valve comprising a housing having a cylindrical opening formed therein and a pressure chamber co-axial with said opening, a trigger slidably received in said opening and movable from a normal non-activated position to an actuating position, an ejector piston slidably received in said pressure chamber and having a shank telescopically received by said trigger, said housing having a duct for directing fluid pressure into said opening, seal means for sealing said duct at line pressure upon said trigger being in its non-activated position, said fluid pressure being directed into said pressure chamber for urging said piston to move in one direction a predetermined distance upon said trigger assuming its actuating position relative to said ejector piston, said piston being tubular in form and said fluid pressure being directed through said piston upon said trigger resuming its normal position and said shank having a cross port which moves into an unsealed position whereby said fluid pressure in said pressure chamber is evacuated through said piston whereby said piston is urged to move relative to said trigger into its normal position.

9. A valve comprising a housing having a cylindrical opening formed therein and a pressure chamber co-axial with said opening, a trigger slidably received in said opening and movable from a normal non-activated position to an actuating position, an ejector piston slidably received in said pressure chamber and having a shank telescopically received by said trigger, said housing having a duct for directing fluid pressure into said opening, seal means for sealing said duct at line pressure upon said

trigger being in its non-activated position, said fluid pressure being directed into said pressure chamber for urging said piston to move in one direction a predetermined distance upon said trigger assuming its actuating position relative to said ejector piston, said piston being tubular in form and said trigger having a cross port which moves into unsealed position for directing said fluid pressure through said piston upon said trigger resuming its normal position and said shank having a cross port which moves into an unsealed position whereby said fluid pressure in said pressure chamber is evacuated through said piston whereby said piston is urged to move relative to said trigger into its normal position.

10. A valve comprising a housing having a cylindrical opening formed therein and a pressure chamber co-axial with said opening, a trigger slidably received in said opening and movable from a normal non-activated position to an actuating position, an ejector piston slidably received in said pressure chamber and having a shank telescopically received by said trigger, said housing having a duct for directing fluid pressure into said opening, seal means for sealing said duct at line pressure upon said trigger being in its non-activated position, said fluid pressure being directed into said pressure chamber for urging said piston to move in one direction a predetermined distance upon said trigger assuming its actuating position relative to said ejector piston, said piston being tubular in form and having a nozzle located therein, said trigger having a cross port which moves into unsealed position for directing said fluid pressure through said nozzle upon said trigger resuming its normal position and said shank having a cross port adjacent said nozzle which moves into an unsealed position whereby said fluid pressure in said pressure chamber is evacuated through said piston and said piston is urged to move relative to said trigger into its normal position.

11. A one direction load piston system comprising a fluid motor containing a piston, valve means for admitting fluid pressure to said fluid motor on one side of said piston to drive the piston in the direction of the load, said valve means comprising a valve member movable from a normal non-activated position to an activated position to admit fluid pressure to said fluid motor and an ejector member movable relative to said valve member upon admission of said fluid pressure to said fluid motor, and passage means in said valve member and said ejector member for connecting said ejector member with said fluid pressure and with said fluid motor upon return of said valve member to its normal non-activated position in order to evacuate said fluid motor and return said piston, and means operable upon return of said piston to return said ejector member to its original position with respect to said valve member.

12. A one direction load piston system comprising a fluid motor open at one end and containing a piston, a valve means movable to admit fluid pressure to the other end of said fluid motor to drive the piston in the direction of the load, and ejector means movable relative to said valve means and connected with said other end of said fluid motor and with said fluid pressure after movement of said piston in the load direction in order to evacuate said fluid motor and return said piston.

13. In a tool for driving a fastening element into a work surface, the combination of a hammer movable from an at rest position to a work position, a shearable ribbon for carrying said fastening element, means for supporting said ribbon across the end of said hammer when said hammer is in its at rest position for locating said fastening element in alignment with said hammer, and means for accumulating drive force against said hammer so as to actuate the same, said ribbon holding said hammer at its at rest position after actuation against movement until the force accumulated thereagainst is sufficient to shear said ribbon and drive said hammer as a rapidly accelerating mass.

14. In a tool for driving a fastening element into a work surface, the combination of a hammer movable from an at rest position to a work position, a shearable ribbon for carrying a plurality of said fastening elements, means for supporting said ribbon across the end of said hammer when said hammer is in its at rest position for locating the foremost fastening element in alignment with said hammer, means for accumulating driving force against said hammer so as to actuate the same, said ribbon holding said hammer at its at rest position after actuation against movement until the force accumulated thereagainst is sufficient to shear said ribbon and drive said hammer as a rapidly accelerating mass, and means associated with the last mentioned means for progressively feeding said ribbon across the path of travel of said hammer upon said hammer resuming its at rest position for again locating the then foremost fastening element in alignment with said hammer.

15. An automatic nail gun for driving a ribbon connected nail into a work surface comprising a hammer movable from an at rest position to a work position, means for directing fluid pressure against said hammer for urging said hammer to move in its work direction, and support means for carrying said ribbon for positioning said nail in an elevated position relative to said work surface and in driving alignment with said hammer, said ribbon extending into the path of travel of said hammer for holding said hammer in its at rest position against movement until the fluid pressure accumulated against said hammer is sufficient to cause said hammer to shear said ribbon and permit conversion of the potential energy of the fluid pressure to kinetic energy of said hammer and said nail for driving said nail into such work surface.

16. A gun for driving a ribbon connected fastening element into a work surface comprising a fluid responsive single-action motor including a piston having a hammer movable from an at rest position to a work position and a housing for slidably receiving said piston, means for slidably carrying said ribbon so that it extends across the path of travel of said hammer for positioning said fastening element adjacent to the striking head of said hammer when said hammer is in its at rest position and in an elevated position relative to a work surface, means for directing fluid under pressure into said housing for the accumulation of potential energy therein for urging said hammer to move in a work direction, said ribbon holding said hammer in its at rest position against movement until the fluid pressure has accumulated sufficiently to cause said hammer to shear said ribbon, whereby the sudden release of the accumulated potential energy in said housing causes rapid acceleration of said piston and fastening element in a work direction for driving said fastening element into said work surface.

17. In an impact tool for individually sequentially driving a plurality of fastening elements carried by a strip having a plurality of shearable resistance portions of predetermined strength, each of such resistance portions normally retaining a corresponding one of said elements in said strip, the combination comprising driving means normally held in an at rest position and movable to drive said fastening elements, means for accumulating potential energy for applying an increasing static force to said driving means while said driving means is in its at rest position and for moving said driving means, means for supplying fluid pressure to said accumulating means for providing the desired potential energy thereto, and means for cooperably sequentially aligning said driving means and individual ones of said fastening elements in the path of travel of said driving means and for holding said fastening elements spaced in an elevated position relative to a working surface at a distance sufficient substantially to convert said potential energy into kinetic energy in said driving means for driving said fastening element into said work surface and whereby

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said resistance portion corresponding with said individual fastening element normally holds said driving means in its at rest position, said resistance portion in alignment with said driving means holding said driving means in its at rest position until said static force upon said driving means causes shearing of said corresponding resistance portion upon the accumulation of sufficient potential energy by said accumulating means for driving said individual fastening element into said work surface.

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