July 26, 1960 R. E. POWERS ET AL 2,946,313

FASTENER DRIVING TOOL AND RELEASE THEREFOR

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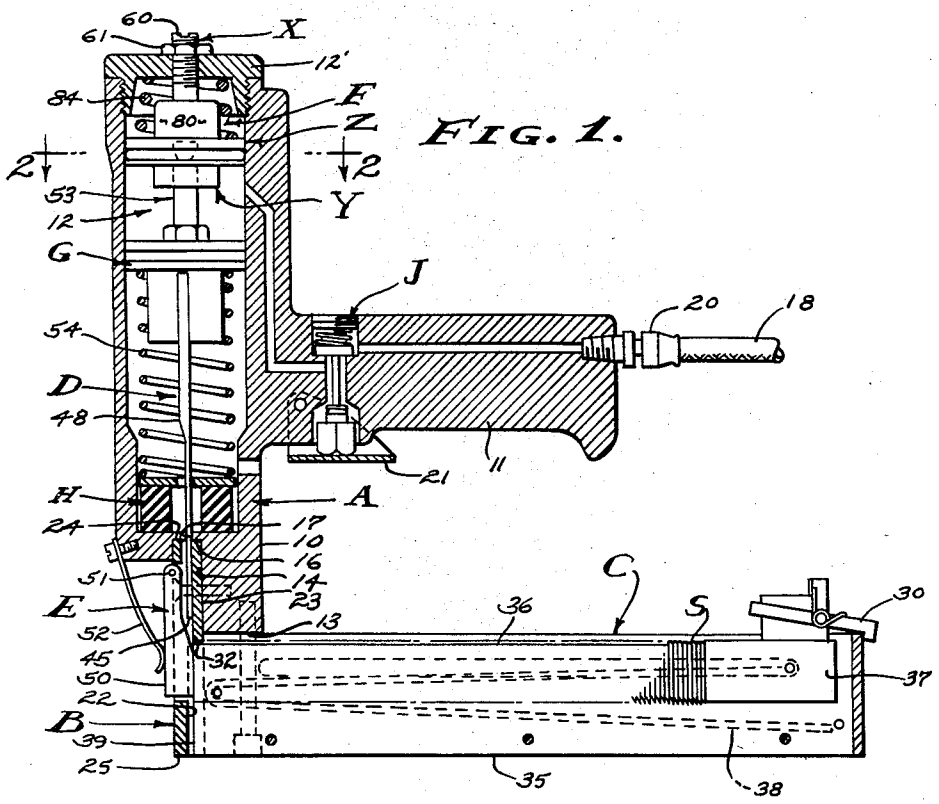


FIG. 1.

FIG. 2.

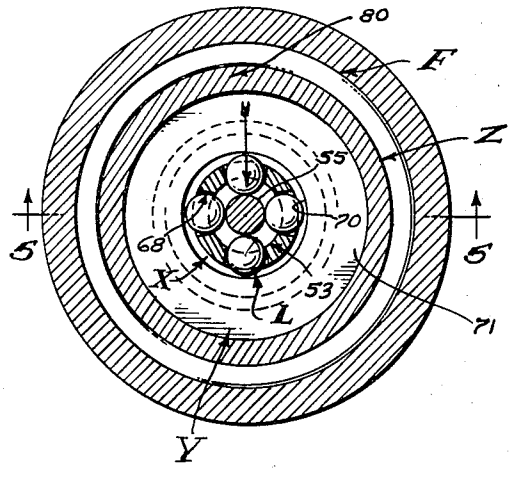
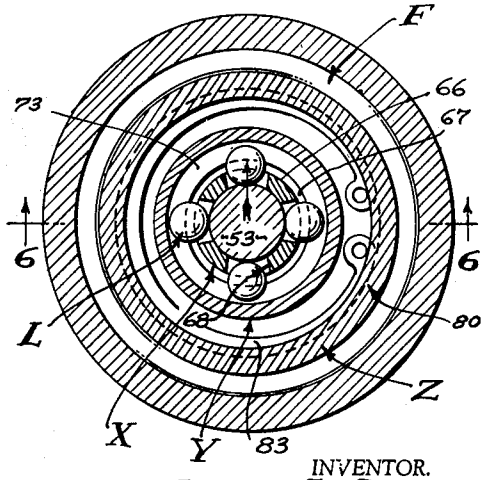


FIG. 3.



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FIG. 4.

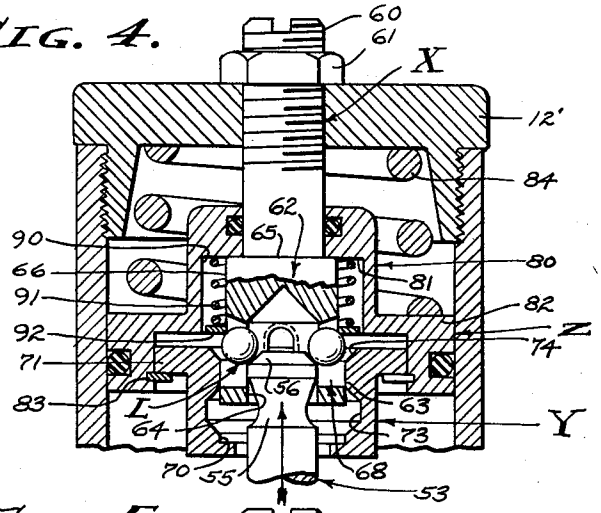


FIG. 5.

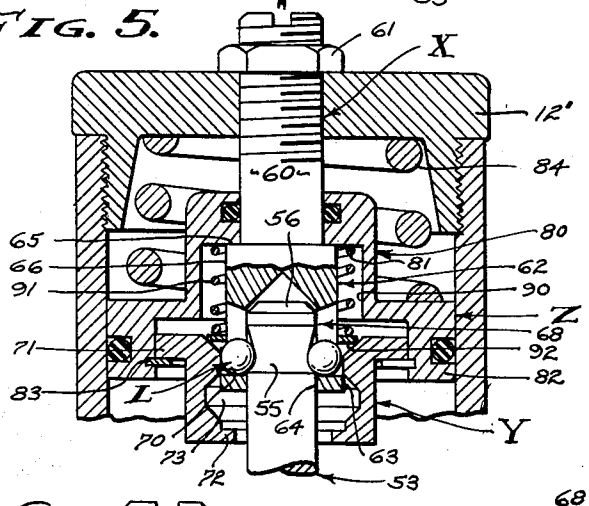
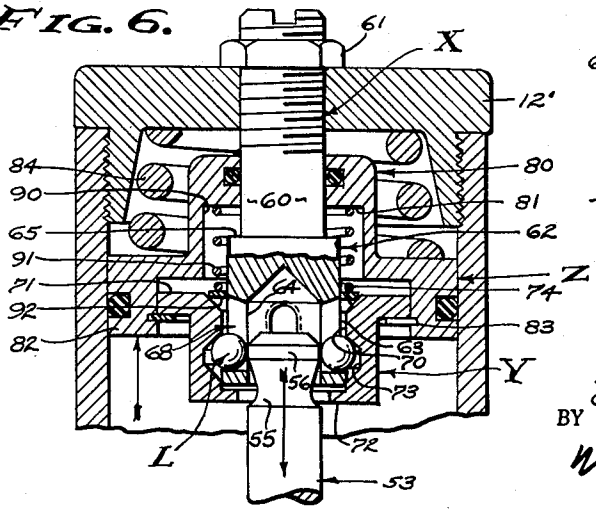


FIG. 6.



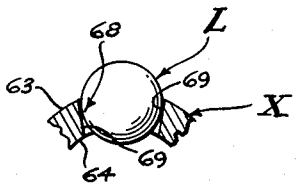


FIG. 7.

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FASTENER DRIVING TOOL AND RELEASE THEREFOR

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Filed Feb. 3, 1958, Ser. No. 712,977

13 Claims. (Cl. 121—13)

This invention is concerned with a fluid operated device or drive and particularly relates to a release for a cylinder and piston drive means for use in fastener driving tools, and the like, it being a general object of this invention to provide a reliable and commercially practical release for tools of the type under consideration wherein substantial driving force or impact is required.

Fluid actuated motors are used to operate fastener driving tools, for example stapling guns and the like. These tools require a substantial driving force in one direction accompanied by quickness of action, and in order to accomplish this result it is common practice to employ a latching means adapted to hold the driving piston in a retracted position until pressure is developed in the cylinder, after which the said piston is released. By releasing the piston after pressure has built up in the cylinder it is possible to obtain the quickness of action desired and which results in the required force and impact at the end of the work stroke of the tool.

Pneumatic tools, or guns, of the type here under consideration have been provided, however, the latching means heretofore provided for releasing the piston have much to be desired. For example, rollers operating in angularly related slots have been commonly employed, said rollers being moved radially inward and outward to engage and disengage a head projecting from the piston of the tool. Use of said rollers is not altogether satisfactory since they become misaligned and jammed, and because the number of rollers that may be used is limited, usually to two rollers only. In other words, latching means involving rollers are not always reliable.

An object of this invention is to provide a fastener driving tool and latching means therefor that provides a reliable locking and releasing action. The latching means that we provide involves balls that are shiftable radially in a predetermined manner to engage and disengage with a head projecting from the piston.

It is an object of this invention to provide a latching means in a fastener driving tool wherein the head projecting from the piston is operated upon by a multiplicity of elements to be engaged and disengaged thereby. With the latching means that we provide a multiplicity of contacts are provided by employing a series of circumferentially disposed balls that move radially in a predetermined manner.

It is still another object of this invention to provide a latching means in a tool of the type under consideration wherein the balls that are employed are not only guided, but are also limited to a restricted inward travel.

It is still another object of this invention to provide a latching means in a tool of the type under consideration wherein the balls are free to move radially outward to receive the head projecting from the piston when the head moves into the latching position.

It is still another object of this invention to provide a latching means in a tool of the type under consideration wherein the balls are moved radially inward to engage

with the head and to be locked therewith when downward force is applied to the piston by fluid pressure.

It is still another object of this invention to provide a latching means in a tool of the type under consideration wherein the balls are released from the head by means responsive to fluid pressure developed in the cylinder to drive the piston through its work stroke.

Also, it is an object to provide a relatively simple and inexpensive latching means of the character above referred to that is reliable in its operation and not subject to failures.

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

Fig. 1 is a side sectional view of a fastener driving tool that incorporates the features of the present invention. Fig. 2 is an enlarged sectional view at the latching means that we provide, taken as indicated by line 2—2 on Fig. 1 and showing the parts thereof in a locked position. Fig. 3 is a view similar to Fig. 2 and showing the parts thereof in a released position. Figs. 4, 5 and 6 are detailed sectional views showing the parts of the latching means in a latching position, a locked position and in a releasing position, respectively, Fig. 5 being a view taken as indicated by line 5—5 on Fig. 2, and Fig. 6 being a view taken as indicated by line 6—6 on Fig. 3. And, Fig. 7 is an enlarged detailed view of a portion of the mechanism illustrating the manner in which the inward movement of the locking means is restricted.

The latching means, or release mechanism, of the present invention is shown incorporated in a pneumatic or air operated tool, or fastener driving gun. The fastener driving tool and release therefor that we have provided may be in the form of a stapling gun and, therefore, in the drawings we have illustrated this type of tool. It is to be understood, however, that the present invention is not limited to this particular kind of tool and may be employed in connection with various tools having cylinder and piston drive means, or the like.

The tool shown in Fig. 1 of the drawings is adapted to be handled manually and involves, generally, a frame A having a body portion 10 and a handle or grip portion 11, a head B carried by the frame A and adapted to direct fasteners into a piece of work, a magazine C for handling a supply of fasteners such as staples and cooperating with the head B so that the staples are received and handled by the head, a driver blade D, a guide means E for handling the staples and accommodating the driver blade D so that it is continuously guided by the head B, latching means F adapted to cooperate with and control operation of the driver blade D, a piston G having driving connection with the driver blade D, a damping means H for the piston G, and a valve means J adapted to control the supply of fluid under pressure to actuate the piston G and operate the latching means F to release the piston.

The frame A carries the various elements of the tool, and is shaped to be conveniently handled by a person. The frame A involves, generally, the body portion and the handle or grip portion 11. The body portion 10 is a simple elongate part having a cylinder 12 extending longitudinally thereof and having an opening or passage 17 extending longitudinally through the lower head end thereof at one end of the cylinder 12, and is characterized by a flat front face 13 and a recess 14. The front face 13 is at the forward end of the body and is normal to the longitudinal axis of the body, while the recess 14 is in the form of a flat seat spaced laterally of the axis of the body parallel therewith. The said seat extends rearwardly from the face 13 to a shoulder 16 where the passage 17, that is rectangular in cross sectional configuration, opens

to the exterior of the body. The shoulder 16 is normal to the longitudinal axis of the body.

The handle or grip portion 11 is provided to give the person handling the tool a convenient means to hold the tool, and it is a simple grip of ordinary construction that projects from the body 10. In practice, the grip 11 may be substantially normal to the axis of the body and may project therefrom as clearly shown.

In structures of the type under consideration it is common practice to provide a fluid pressure supply connection 18 at the grip 11, such as a pneumatic hose or the like, and also to include a control means at the grip 11. It is to be understood that any suitable fluid pressure supply can be provided without affecting the present invention. When compressed air is employed, as in the case illustrated, the hose of the power connection 18 is attached to the grip 11 through a quick disconnect 20 and the valve means J is under control of a finger operated trigger 21.

The head B is, in effect, an extension of the body 10 of the frame A and is provided to receive and deliver fasteners such as staples to the work being acted upon by the tool. The head B is carried by the body 10 in the recess 14 and is provided with a longitudinal guideway 22 that extends through and opens at the ends of the head B. The head B has a bottom face 23 engaged with the seat of recess 14, it has a rear end face 24 normal to the axis thereof and engaged with the shoulder 16, and it has a front end face 25 engageable with the work.

In the particular form of the invention shown, the guideway 22 is adapted to handle fasteners or staples S that are U-shaped and formed of wire, or the like, having a pair of sharpened ends. The staples referred to are substantially elongate with straight parallel shanks joined by a curved back. It will be apparent how the guideway 22 can be proportioned so that it will readily pass the staples with clearance and will act upon the staples to guide them as they are delivered through the head B and from the tool. The guideway 22 is a continuation of the passage 17 above described and guides the driver blade of the tool as well as the staples S that are handled thereby.

A fastener or staple receiving opening 32 extends laterally through the head B, which opening enters the bottom face 23 of the head and opens into the passage 22 so that the staples S fed to the head B are properly guided and aligned with the passage 22 before they are engaged by the driver blade D of the mechanism. The passage 22 has a staple guiding portion at the front of the head B of sufficient width to freely pass a fastener or staple handled by the head B, and the passage 22 has a blade guiding portion rearward of the first mentioned portion that is of increased width in order to accommodate the relatively large plunger or driving blade D.

The magazine C is adapted to handle a supply or stack of fasteners or U-shaped staples S and involves, generally, a case 35 carried by the frame A, a guide 36 within the case 35, a follower 37 adapted to advance the fasteners or staples, and a feed spring 38 yieldingly urging the follower toward the head B. The case 35 is carried by the front face of the body 10 and is an elongate part that projects laterally from the frame A. The case is shell-like in form and the guide 36 is a core-like part that is carried within and is coextensive with the case 35. The case 35 and guide 36 are shaped so that a longitudinal passage is formed, which passage conforms in general configuration to the U-shaped staples S which are handled by the head B.

The guide 36 enters the fastener or staple receiving opening 32 and terminates in a flat end 39 that occurs in the plane of the bottom wall of the guideway 22. The follower 37 conforms with the configuration of and is slideably carried in the passage in the guide 36 and is yieldingly urged toward the head B by the feed spring 38. Means is provided to prevent the follower 37 from entering the guideway 22. The fasteners or staples S are inserted into the magazine C through the open top thereof by simply engaging them over the guide 36 ahead of the follower 37 tensioning the spring 38. As clearly shown, a spring biased latch 30 secures the follower 37 in a retracted position when desired, thus facilitating insertion of the fasteners.

The driver blade D is essentially a slender elongate part rectangular in cross sectional configuration and terminates at its forward end in a flat fastener or staple driving face 45. The blade D has a staple driving portion at the forward end thereof which occupies the staple guiding portion of the guideway 22 when the driver is in the advanced position (not shown), and also has a stem that is guided by the blade guiding portion of the guideway 22. As shown, the blade D is provided with an inclined cam or face 48 that is pitched upwardly and rearwardly and which is provided to shift the guide means E.

The guide means E is in the form of a closure of gate 50 that is pivotally carried by the head B so that it normally substantially occupies the top of the head B. As shown, the gate 50 is elongate and is shiftably carried by the head B by means of a pivot pin 51. A spring 52 is provided to yieldingly hold the gate 50 in a down or normal position where it forms a continuation of the guideway 22 and thereby guides the staples handled by the tool and also guides the driver blade D of the tool. A head construction for a fastener driver of the type referred to is particularly set forth and claimed in Letters Patent No. 2,784,406 issued to Richard E. Powers March 12, 1957.

The latching means F that we have provided in accordance with the present invention is adapted to cooperate with and control operation of the piston G. The means F is is provided to couple with and to hold the piston G at the upper end of the cylinder 12 and to release the piston G when sufficient fluid pressure has been established in the cylinder to effect the desired work stroke of the tool. For this purpose a latching stem 53 projects from the top of the piston G, and is shaped to be engaged and disengaged by the latching means F. The piston G is slideably operable in the cylinder 12 and is actuated by fluid pressure to advance in the cylinder 12 in a manner common to tools of the type under consideration. The piston G is suitably coupled to the driver blade D and has sealing means, preferably an O ring type seal. In order to retract the piston G there is provided a return spring 54 acting under compression between the lower end of the cylinder 12 and the bottom of the piston G.

The latching stem 53 that is provided to be held by the latching means F is an elongate cylindrical element that projects upwardly from the top of the piston G on the central axis thereof. The terminal end portion of the latching stem 53 is shaped to cooperatively engage with the latching means F and involves an annular recess or channel 55. The channel 55 is formed in the outer peripheral wall of the stem and it is arcuate in cross sectional configuration in order to have seating engagement with the locking balls hereinafter referred to. In practice, the depth of the channel 55 is equal to approximately one quarter the diameter of said balls (as shown). In carrying out the invention, the upper wall of the channel 55 is tapered upwardly and outwardly to the end that the terminal end portion of the stem is in the form of an inverted cone (see Figs. 4, 5 and 6). Further, the top of the head or stem 53 is flat in a plane normal to the axis thereof, and is chamfered at the periphery 56, preferably at a 45° angle. The shape of the head or stem facilitates the function of latching, locking and release, as hereinafter set forth.

The latching means F is provided to cooperatively engage with the latching stem 53, above referred to, and is adapted to latch onto the stem 53, to lock it in a fixed position, and to release it when a predetermined fluid pressure is developed within the cylinder 12. As best illustrated in Figs. 4, 5 and 6 of the drawings, the latching means F involves, generally, an anchor X, lock balls L,

a release sleeve Y, and a pressure responsive means Z. The anchor X adjustably positions the elements of the latching means in order to obtain the desired releasing action, and it is formed to guide the lock balls L for proper functioning. The lock balls L move or shift radially inward and outward to be engaged with and disengaged from the latching stem **53**. The sleeve controls radial movement of the balls L, and the pressure responsive means Z actuates the sleeve Y in response to fluid pressure within the cylinder **12**.

The anchor X, that adjustably positions the elements of the latching means F and which guides the balls L, is a straight elongate part that is carried by the cylinder head **12'** to depend into the cylinder **12** on the central axis thereof. The anchor X is shiftable axially of the cylinder **12** and for securing the desired adjustment it has a theaded stem **60** threadedly carried in the head **12'** and secured in the selected position by means of a lock nut **61**. The lower end portion of the anchor X is in the form of a head **62** having a turned exterior wall **63** slidably carrying the sleeve Y and having a central bore **64** slidably receiving the top terminal end portion of the latching stem **53**. The head **62** is larger in diameter than the stem **60** presenting an upwardly facing end **65** that forms a stop for the means Z later described. The exterior wall **63** of the head is stepped at **66** to form an upwardly facing shoulder **67** (as shown).

As clearly illustrated in the drawings, the head **62** is formed to carry and guide the lock balls L and has therefor a plurality of guide openings **68** formed therein, for example we have shown four such openings **68**. The openings **68** are elongate vertically disposed slot-shaped openings slightly wider than the diameter of the balls L, so that the balls are free to move radially and vertically in the openings. The openings **68** extend through the wall of the head **62** between the exterior wall **63** and bore **64**, the thickness of said wall (in the case illustrated) being approximately 75% of the diameter of the balls L.

In accordance with the invention, and as illustrated in Fig. 7 of the drawings, the openings **68** are formed so as to limit inward movement of the balls L. Therefore, we have tapered the sides **69** of the openings, for example at about 10°, and so that the balls L engage the sides **69** when, as in the case illustrated, 25% of each ball projects inwardly into the bore **64**. As a result, the balls L do not fall into the bore **64** to be misplaced, there being one ball L operating in each opening **68**. Further, the top of the opening **68** is pitched while the bottom is not, the top being pitched at, for example, 20°. In practice, we employ a tapered cutter to form the openings **68**, the axis of rotation of the cutter being pitched or inclined to establish the horizontal bottoms and substantially inclined tops, as shown.

The release sleeve Y that controls radial movement of the balls L is shiftable axially relative to the head **62** and is engaged over the head. The sleeve Y has a bore **70** slideably engaged with the wall **63** of the head, an outwardly projecting radial flange **71** at the upper end thereof and an inwardly projecting radial flange **72** at the lower end thereof. The flange **71** is provided to engage with the pressure responsive means Z to be actuated thereby, while the flange **72** is provided to limit upward travel of the sleeve Y. In accordance with the invention, the sleeve Y has a recess **73** formed in the bore **70** at or near the lower end portion of the sleeve. The recess **73** is a continuous annular recess that is normally positioned below the series of openings **68**, for example when the sleeve is in a down position as shown in Figs. 4 and 5. When the sleeve is in said down position the upper portion of the bore **70** surrounds the lower portion of the slot-shaped openings **68** to prevent outward radial movement of the balls L (see Fig. 5). As shown, the upper end of the bore **70** is chamfered at **74**, preferably at 45°, and the side walls of the annular recess **73** are also pitched at 45°. When the sleeve is in an up position, as shown in Fig. 6, the annular recess **73** is opposite the lower end portions of the openings **68** and outer spherical portions so that the balls L are received in the recess **73** and so that the inner spherical portions of the balls L are withdrawn from the bore **64** and latching stem **53** (see Fig. 3).

The pressure responsive means Z that actuates the sleeve Y is responsive to fluid pressure in the cylinder **12** and is in the form of a piston and is provided to engage with and shift the sleeve Y to release the balls L when a predetermined fluid pressure is developed within the cylinder **12**. In the particular case illustrated, the piston body **80** of the means Z is carried over and surrounds the above described elements of the means F. The body **80** is an inverted cup-shaped part slidably engaged with the stem **60** and sealed off therefrom by means of an O ring seal. A downwardly facing seat **81** is formed on the body **80** to have stopping engagement with the top end **65** of the head **62** when the means Z is in a normally unactuated position (see Figs. 4 and 5). The body **80** is formed with a cylindrical skirt **82** that slidably receives the flange **71** of the sleeve Y for limited axial movement between the body and sleeve. The sleeve Y is mechanically coupled to the body **80** by means of a snap-ring **83** so that lifting of the body **80** causes lifting of the sleeve Y.

The piston body **80** of the pressure responsive means Z is yieldingly urged to the unactuated position by means of a spring **84**, and it is sealed with the cylinder **12** by means of a packing, for example an O ring seal. The spring **84** acts under compression between the cylinder head **12'** and the top of the body **80** to the end that said spring is compressed when fluid under pressure is introduced into the cylinder between the piston G and piston body **80** causes lifting of the sleeve Y and consequent release of the balls L.

A counterbore **90** is provided in the piston body **80** to accommodate biasing means that yieldingly urges the balls L downwardly. In practice we employ a compression spring **91** that urges a washer **92** downwardly into engagement with the top of the balls L. The washer **92** is slidably engaged over the stepped portion of the head **62** and is adapted to be stopped by the shoulder **67**.

When the piston G is raised (or retracted) by the return spring **54**, the latching stem **53** enters the bore **64** in the anchor head **62**. During this operation (see Fig. 4) the balls L which normally project somewhat into the bore **64**, are engaged by the chamfer **56** on the latching stem **53** and are lifted, lifting the washer **92** and compressing the spring **91**. When the parts reach the position illustrated in Fig. 4 the balls are moved radially outward, at the top of the sleeve Y, through action of the chamfer **56** and top inclined side **69** of the opening **68**. Thus, the latching stem **53** passes the balls L and enters into the bore **64**.

When the piston G is held in said raised (or retracted) position by the spring **54**, the balls L are yieldingly urged into locking position by the biasing means and washer **92**. That is, the spring biased washer **92** urges the balls L inwardly, the balls L being guided by the chamfer **74** on the sleeve Y and by the upper wall of the channel **55** in the latching stem **53**. When the balls are in the locked position shown in Fig. 5 of the drawings the balls are held radially inward by the bore **70** in the sleeve Y, so that downward force can be applied to the piston G without movement thereof and with the result that the piston G is locked in an up position.

When the piston body **80** of the pressure responsive means Z is lifted by fluid pressure, the sleeve Y is lifted, and when the parts reach the position shown in Fig. 6, the balls L shift radially outward into the recess **73** in the sleeve Y, thereby rleasing the latching stem **53** and piston G. The sleeve Y is free to move upwardly relative to the piston body **80**, a limited distance which action occurs by virtue of the cam action involved when the balls L engaged with the pitched sides of the recess **73**.

From the foregoing it will be apparent that we have provided a commercially practical latch and release for

use in connection with fastener driving tools. Each time the valve means J is operated to admit fluid pressure to the cylinder 12, pressure is built up within the cylinder 12 until the pressure responsive means Z is operated to actuate the release of the piston G. When the valve means J is operated to exhaust fluid from the cylinder 12 the return spring retracts or raises the piston G and latching stem 53 so that the head is latched or locked with the balls L, all as hereinabove pointed out.

Having described only a typical preferred form and application of our invention, we do not wish to be limited or restricted to the specific details herein set forth, but wish to reserve to ourselves any variations or modifications that may appear to those skilled in the art and fall within the scope of the following claims.

Having described our invention, we claim:

1. A fluid operated tool of the character described including, a cylinder, a piston engaged in the cylinder for operation axially thereof, there being a latching stem projecting from the piston, and a releasable latching means comprising, an anchor carried by the cylinder, a radially shiftable ball guided by a longitudinal slot-shaped opening formed in the anchor and controlled by a sleeve to latch onto the stem, and a pressure responsive means to shift the sleeve and to thereby release the ball both radially and longitudinally from latching engagement with the stem.

2. A fluid operated tool of the character described including, a cylinder, a piston engaged in the cylinder for operation axially thereof, there being a latching stem projecting from the piston, and a releasable latching means comprising, an anchor carried by the cylinder, a radially shiftable ball guided by a longitudinal slot-shaped opening formed in the anchor and controlled by a sleeve to latch onto the stem, said opening being tapered to restrict inward shifting of the ball and having a flat bottom for seating engagement with the ball, and a pressure responsive means to shift the sleeve and to thereby release the ball both radially and longitudinally from the bottom of said opening and from latching engagement with the stem.

3. A fluid operated tool of the character described including, a cylinder, a piston engaged in the cylinder for operation axially thereof, there being a latching stem projecting from the piston, and a releasable latching means comprising, an anchor carried by the cylinder and having a head with a bore adapted to receive the stem projecting from the piston and with a longitudinal slot-shaped opening entering laterally into said bore, a radially and longitudinally shiftable ball carried in said opening and guided to project into said bore and controlled by a sleeve to latch onto the stem projecting from the piston, and a pressure responsive means to shift the sleeve and to thereby release the ball both radially and longitudinally from latching engagement with the stem projecting from the piston.

4. A fluid operated tool of the character described including, a cylinder, a piston engaged in the cylinder for operation axially thereof, there being a latching stem projecting from the piston, and a releasable latching means comprising, an anchor carried by the cylinder and having a head with a bore adapted to receive the stem projecting from the piston and with a longitudinal slot-shaped opening entering laterally into said bore, a radially and longitudinally shiftable ball carried in said opening and guided to project into said bore and latch onto the stem projecting from the piston, a sleeve surrounding the head and normally holding the ball inwardly and shiftable to a position allowing the balls to shift radially outwardly, and a pressure responsive means to shift the sleeve and to thereby release the ball from the stem and comprising a piston surrounding the said head and engaged in the cylinder for operation axially thereof and coupled to the sleeve to lift the same.

5. A fluid operated tool of the character described including, a cylinder, a piston engaged in the cylinder for operation axially thereof, there being a latching stem projecting from the piston, and a releasable latching means comprising, an anchor carried by the cylinder and having a head with a bore adapted to receive the stem projecting from the piston and with a longitudinal slot-shaped opening entering laterally into said bore, a radially and longitudinally shiftable ball carried in said opening and guided to project into said bore and latch onto the stem projecting from the piston, a sleeve surrounding the head and with a bore and normally holding the balls radially inwardly and with a recess shiftable to a position allowing the balls to shift radially outwardly, and a pressure responsive means to shift the sleeve and thereby to release the ball from the stem and comprising a piston surrounding the said head and engaged in the cylinder for operation axially thereof and with a cylindrical skirt slidably engaged with and coupled to the sleeve to lift the same.

6. A fluid operated tool of the character described including, a cylinder, a piston engaged in the cylinder for operation axially thereof, there being a latching stem projecting from the piston, and a releasable latching means comprising, an anchor carried by the cylinder and having a head with a bore adapted to receive the stem projecting from the piston and with a longitudinal vertically disposed slot shaped opening in the head and entering the bore therein, a radially shiftable ball carried in said opening and guided thereby to shift vertically and radially outwardly when the head is projected into said bore and to then shift downwardly and radially inwardly to latch onto the stem, and a pressure responsive means to release the balls from the stem projecting from the piston.

7. A fluid operated tool of the character described including, a cylinder, a piston engaged in the cylinder for operation axially thereof, there being a latching stem projecting from the piston, and a releasable latching means comprising, an anchor carried by the cylinder and having a head with a bore adapted to receive the stem projecting from the piston and with a longitudinal vertically disposed slot shaped opening in the head and entering the bore therein, a radially shiftable ball carried in said opening and guided thereby to shift vertically and radially outward when the head is projected into said bore and to then shift downwardly and radially inward to latch onto the stem, a sleeve surrounding the head and normally holding the radially, inwardly and shiftable to a position allowing the ball to shift radially outwardly, and a pressure responsive means to shift the sleeve to release the ball from the stem projecting from the piston.

8. A fluid operated tool of the character described including, a cylinder, a piston engaged in the cylinder for operation axially thereof, there being a latching stem projecting from the piston, and a releasable latching means comprising, an anchor carried by the cylinder and having a head with a bore adapted to receive the stem projecting from the piston and with a longitudinal vertically disposed slot shaped opening in the head and entering the bore therein, a radially shiftable ball carried in said opening and guided thereby to shift vertically and radially outward when the head is projected into said bore and to then shift downwardly and radially inwardly to latch onto the stem, a sleeve surrounding the head and with a bore and normally holding the ball radially inwardly and with a recess shiftable to a position allowing the ball to shift radially outwardly, and a pressure responsive means to shift the sleeve to release the ball from the stem projecting from the piston.

9. A fluid operated tool of the character described including, a cylinder, a piston engaged in the cylinder for operation axially thereof, there being a latching stem projecting from the piston and with an annular channel shaped recess therein, and a releasable latching means comprising, an anchor carried by the cylinder and having a head with a bore adapted to receive the stem projecting from the piston and with a longitudinal vertically disposed

slot shaped opening in the head and entering the bore therein, a radially shiftable ball carried in said opening and guided thereby to shift vertically and radially outward when the head is projected into said bore and to then shift downwardly and radially inward to latch onto the stem, means yieldingly urging the ball axially and downwardly, and a pressure responsive means to shift the ball and to release it from the stem projecting from the piston.

10. A fluid operated tool of the character described including, a cylinder, a piston engaged in the cylinder for operation axially thereof, there being a latching stem projecting from the piston and with an annular channel shaped recess therein, and a releasable latching means comprising, an anchor carried by the cylinder and having a head with a bore adapted to receive the stem projecting from the piston and with a longitudinal vertically disposed slot shaped opening in the head and entering the bore therein, a radially shiftable ball carried in said opening and guided thereby to shift vertically and radially outward when the head is projected into said bore and to then shift downwardly and radially inward to latch onto the stem, a sleeve surrounding the head and normally holding the ball radially inwardly and shiftable to a position allowing the ball to shift radially outwardly, means yieldingly urging the ball axially and downwardly, and a pressure responsive means to shift the sleeve to release the ball from the stem projecting from the piston.

11. A fluid operated tool of the character described including, a cylinder, a piston engaged in the cylinder for operation axially thereof, there being a latching stem projecting from the piston and with an annular channel shaped recess therein, and a releasable latching means comprising, an anchor carried by the cylinder and having a head with a bore adapted to receive the stem projecting from the piston and with a longitudinal vertically disposed slot shaped opening in the head and entering the bore therein, a radially shiftable ball carried in said opening and guided thereby to shift vertically and radially outward when the head is projected into said bore and to then shift downwardly and radially inward to latch onto the stem, a sleeve surrounding the head and with a bore normally engaging and holding the ball radially inwardly and with a recess and shiftable to a position allowing the ball to shift radially outwardly, means yieldingly urging the ball axially and downwardly, and a pressure responsive means to shift the sleeve to release the ball from the stem projecting from the piston.

12. A fluid operated tool of the character described including, a cylinder, a piston engaged in the cylinder for operation axially thereof, there being a latching stem projecting from the piston, and a releasable latching means comprising, an anchor carried by the cylinder, a radially shiftable ball guided by the anchor and adapted to latch onto the stem, and a pressure responsive means to shift the ball to release it from the stem, and comprising a piston surrounding the said head and engaged in the cylinder for operation axially thereof and biased to shift when fluid pressure is developed in the cylinder, the last mentioned piston being coupled to the sleeve to lift the same.

13. A fluid operated tool of the character described including, a cylinder, a piston engaged in the cylinder for operation axially thereof, there being a latching stem projecting from the piston, and a releasable latching means comprising, an anchor carried by the cylinder and having a stem with a head with a bore adapted to receive the stem projecting from the piston, a radially shiftable ball guided by the head to project into said bore and latch onto the stem projecting from the piston, and a pressure responsive means to shift the ball to release it from the stem projecting from the piston and comprising a piston surrounding the said head and in slidable sealed engagement with the stem of the anchor and engaged in the cylinder for operation axially thereof and biased in one direction so as to shift when fluid pressure is developed in the cylinder.

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