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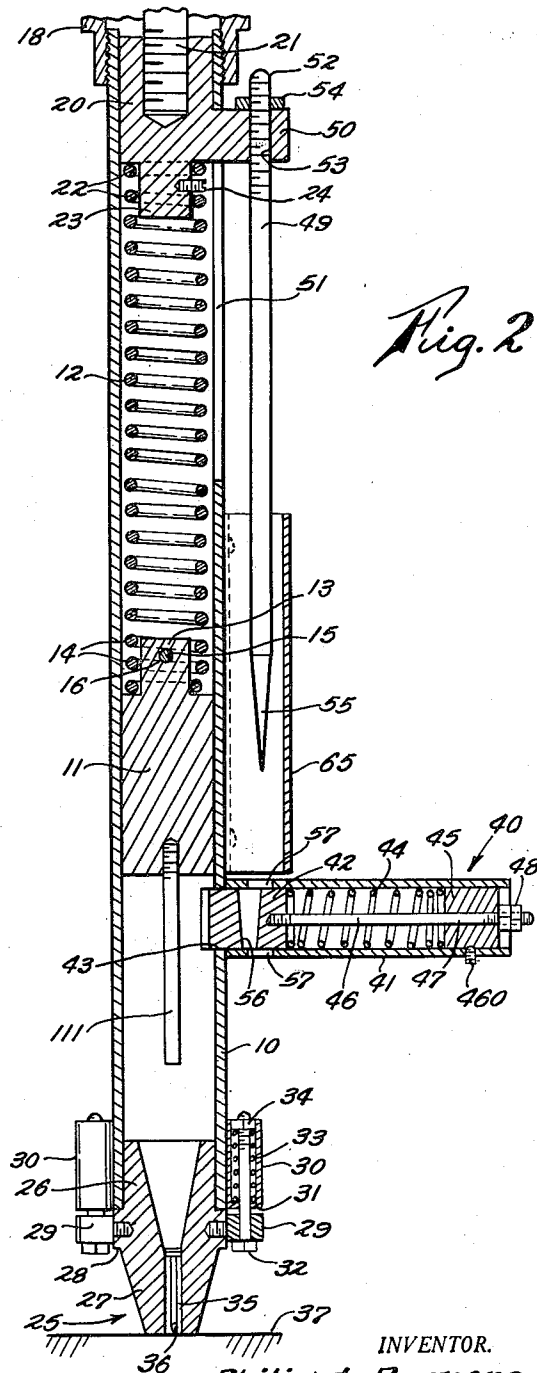
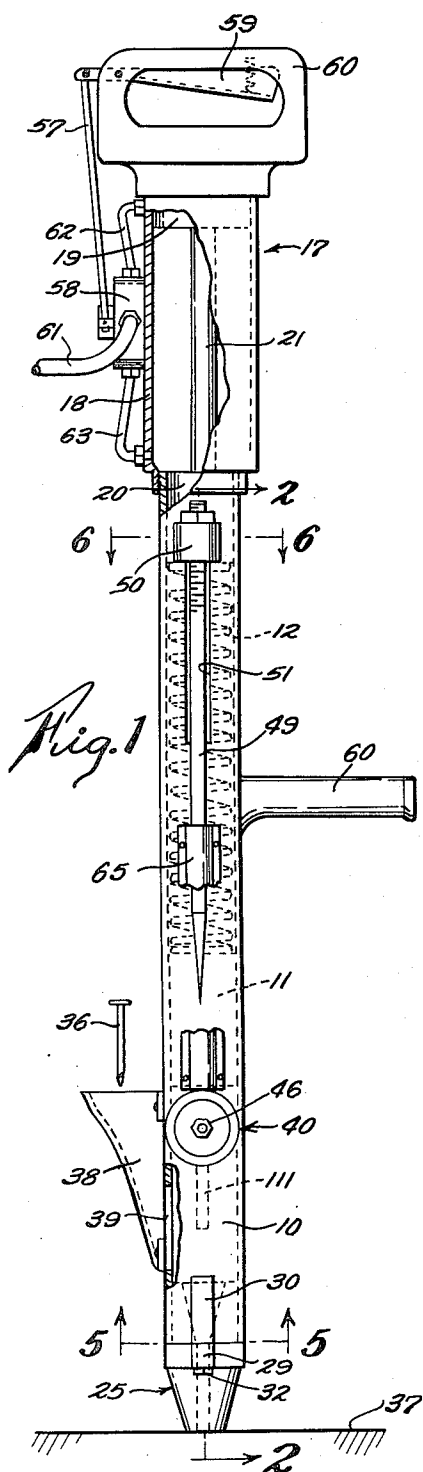
P. DE ANGUERA

2,765,463

SINGLE STROKE PIN OR NAIL DRIVER

Filed June 17, 1955

2 Sheets-Sheet 1



INVENTOR.

Philip de Anguera

BY

Murray, Sackhoff & Murray
ATT'YS

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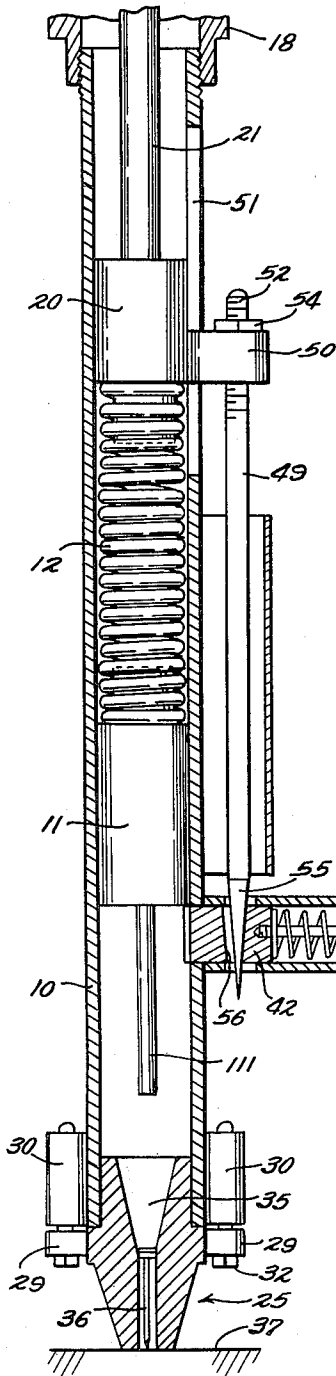


Fig. 3

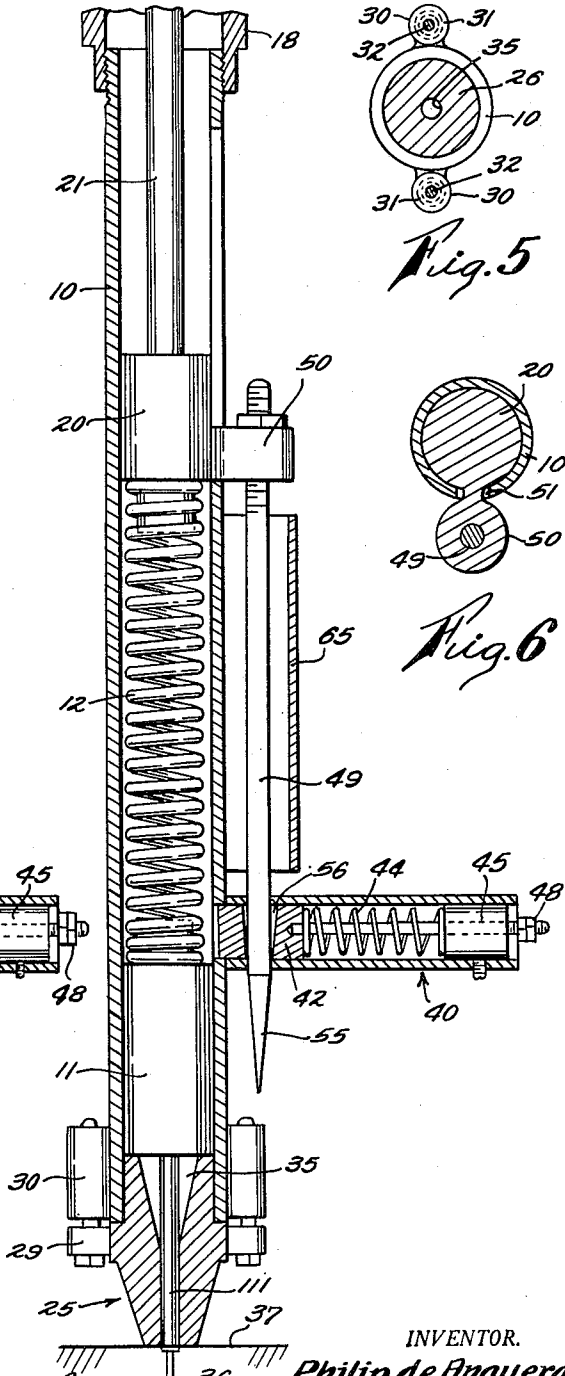


Fig. 4

INVENTOR.

Philip de Anguera

BY

Murray, Sackhoff & Murray
ATTYS

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SINGLE STROKE PIN OR NAIL DRIVER

Philip de Anguera, Cincinnati, Ohio

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8 Claims. (Cl. 1—44.4)

The present invention relates to improvements in pin or nail driving appliances of the single stroke variety and is particularly directed to a mechanism for efficiently obtaining a positively controlled and improved nail or pin driving stroke for the hammer in such appliances.

The principal object of this invention is to secure an improved hammer stroke or nail driving appliance by the provision of a novel spring loaded hammer propelling mechanism and a positive acting and adjustable control therefor.

Another object of the invention is to provide a reliable pin or nail driving appliance that continuously delivers the same driving blow regardless of a pressure change in the air source. Variations in the air pressure in the factory main or between mains in different factory locations will have no effect whatever on the accurate pin or nail driving performance of my appliance specifically because the hammer release for my appliance cannot be tripped until a predetermined hammer driving potential has been built up in the hammer driving spring and in the pneumatic cylinder for compressing the said spring.

A further object of the invention is to provide in an appliance having the foregoing characteristics a hammer driving action of materially increased velocity by reason of the effective thrust of the cylinder upon the compressed spring at the time of spring release and continuously through and during the hammer driving expansion stroke of the spring.

A still further object of this invention is to provide an improved nail or pin positioning means for my appliance, said means insuring flush insertion of all nails or pins with a single driving stroke without marring the surface of the work.

With these and other objects in view the invention consists in the novel combination of parts specifically set forth in the following specification and in the appended claims, reference being had to the accompanying drawings, wherein:

Fig. 1 is a side elevational view of my nail or pin driving appliance, parts thereof being broken away and other parts being shown in section.

Fig. 2 is an enlarged section taken on line 2—2 of Fig. 1 showing the appliance parts in normal inoperative positions.

Fig. 3 is a view similar to Fig. 2 showing the parts in intermediate nail driving positions.

Fig. 4 is another view similar to Fig. 2 showing the parts in their positions at the end of the nail driving stroke.

Fig. 5 is an enlarged section taken on line 5—5 of Fig. 1.

Fig. 6 is an enlarged section taken on line 6—6 of Fig. 1.

The pin or nail driving appliance of this invention comprises an elongated tubular casing 10 which houses a reciprocated hammer 11 and a coil spring 12. The spring and hammer are connected together at common ends by providing a reduced shoulder 13 on the hammer over which is fitted the end coils 14—14 of the spring, a set

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screw 15 being interposed between adjacent end coils of said spring and threaded in a tapped bore 16 formed in said shoulder. The spring is placed under operative compression by a pneumatic motor 17 comprising a motor cylinder 18 fixed concentrically on the upper end of the casing 10, the motor cylinder having a piston 19 therein that is connected to a plunger 20 by a rod 21. The plunger is housed in the casing 10 and is operatively connected to the upper end coils 22—22 of the spring 12 by means of a reduced shoulder 23 formed on the plunger and entered into the said end coils, a set screw 24 threaded in the shoulder being interposed between the said end coils to preclude axial displacement of the spring end with respect to said plunger.

The lower end of the casing 10 has yieldably mounted thereon a nail or pin positioning means 25 which comprises a body member having a cylindrical end portion 26 freely entered into the bottom end of the casing 10 and an opposed cone shaped nose portion 27, an external shoulder 28 being formed intermediate said portions to serve as a stop with the casing end to preclude movement of the positioning means into the casing. The shoulder carries opposed lugs 29—29 which are positioned in longitudinal alignment with opposed sleeves 30—30 fixed on the casing. As best shown in Figs. 2 and 5 the lower end of each sleeve is closed by a lateral web 31, a head tensioning bolt 32 freely passing through bores formed in each lug and web and extending into the sleeve and through a coil spring 33. A nut 34 is threaded on the upper end of each bolt and is drawn up on that bolt to place each spring under the desired operative compression between the nut and the web 31. A funnel shaped bore 35 is formed axially through the head for holding fasteners such as a nail 36 in position to be driven into work 37 by the hammer 11. Fasteners are preferably fed into a chute 38 (Fig. 1) fixed to the casing, said chute being adapted to direct the fasteners through a slot 39 formed in the casing so that said fasteners may fall by gravity into the positioning bore 35 in the head.

With particular reference to Fig. 2 it will be noted that the hammer 11 includes a nail engaging rod 111 removably threaded in a bore formed coaxially on the hammer as illustrated in Fig. 4 this rod has a projected length corresponding to the length of the funnel shaped bore 35 formed in the nail or pin positioning means 25 so that the rod cannot be projected beyond said means. Further it is to be noted that the positioning means has a relatively blunt work engaging end surface located in a plane normal to the bore 35. Thus when an excess of energy is delivered to the hammer by the spring 12 the rod cannot be driven into the wood, such excess, if any, being transmitted by the hammer 11 to the end portion 26 of the positioning means 25, the blunt work engaging surface of said means being large enough to absorb the unexpended part of the hammer blow without marring the surface of the work. The foregoing arrangement therefore provides a means for absorbing an excess of hammer driving energy, for which the machine must be usually set, because it is desirable that one machine setting should take care of density inequalities in the particular work such as occasioned by knots or soft spots in wood, and the like. Further the mechanism provides a readily adjustable means for adapting the driver to various sized pins or nails, it only being necessary to remove and replace the positioning means 25 and a corresponding rod 111 for that purpose.

The normal, inoperative position of the hammer is illustrated in Figs. 1 and 2 of the drawings and it is there to be noted that the hammer 11 is detained from movement toward the fastener positioning means 25 by a detent means generally indicated by the numeral 40. The detent means has a tubular housing 41 fixed as by weld-

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ing to the casing 10 and positioned thereon at right angles to the longitudinal dimension of said casing. A retractible bolt 42 is mounted for sliding movement in the inner end of the housing 41 and normally has its end portion projecting through an opening 43 formed in the casing and into the path of the hammer 11. The bolt is biased toward said projected position by an expansile spring 44 located within the housing and bearing at one end against the bolt 42 and having its opposed end bearing against an abutment 45 fixed in the housing 41 by a set screw 460 that is threaded in the housing and bears at its inner end against said abutment. The normal projected position of the bolt is determined by a rod 46 threaded in the bolt 42 and having its threaded outer end freely extending through a through-bore 47 formed in the abutment, a nut 48 being threaded to the rod for adjusting the normal position of the bolt with precision.

The means for tripping the detent means 40 to release the hammer comprises a trip rod 49 mounted on a lateral extension 50 of the plunger, the extension projecting through and moving in an elongated slot 51 formed in the casing. The trip rod has an adjustable end 52 threaded in a through-bore 53 formed in the extension 50, a set nut 54 being threaded on the rod end 52 to fix the adjusted position of the rod. The free end of the rod is tapered at 55 and when the plunger 20 is moved forward by the pneumatic motor this tapered end is thrust into a tapered through hole 56 formed in the bolt 42, to move the bolt out of the path of the hammer. Two opposed holes 57—57 are formed in the housing 41 to permit free passage of the trip rod through the housing.

As shown in Fig. 1 the pneumatic motor is controlled by the usual four-way valve 58 mounted on the side of the motor and manually controlled by a spring pressed trigger 59 pivotally mounted in a handle 60 for the device, said trigger having a control rod 61 connecting it to the said valve. Pressure air from a source through pipe 61 is alternately introduced into opposite ends of the pneumatic motor by lines 62 and 63, it being noted that the line opposed to the pressure air carrying line exhausts its cylinder side to atmosphere as is usual in the art. Another handle 64 is provided for the device for ease of handling and a protector 65 may be placed around the trip rod 49 to prevent accidental crushing of the operator's hand between the leading end of the trip rod 49 and the bolt 42.

The operation of the appliance according to the invention is briefly as follows:

It is assumed that the trip rod 49 has been adjusted on the lateral extension 50 so that its effective length will release the hammer detent means 40 when the required hammer driving potential has been built up in the spring 44 and in the pressure air chamber behind the piston 19 in the pneumatic motor to drive a selected fastener into the mass of a particular work piece or pieces. For example let the work 37 be two maple wood boards that are to be secured together by one or more nails. With a little experience and a few trial runs the rod 49 can be precisely adjusted so that the appliance will fully drive the nail into the boards with its head flush with the board surface without marring said surface in any way. As shown in Figs. 1 and 2 the trip rod is in its adjusted position, a factory source of pressure air is introduced into the pipe 61, the appliance is placed upon the work and a fastener is dropped into the positioning means 25. The trigger 59 is then pressed which introduces pressure air behind the piston 19, thus driving the piston and its connected plunger 20 downwardly to compress the spring 12 between the plunger and the hammer held in normal position behind the projected detent bolt 42 (Fig. 3) whereby the spring is placed under the desired compression for moving the hammer through a single nail driving stroke. With reference to Fig. 3 it will further be noted that pressure in the pneumatic cylinder behind the piston 19 must also build up to predetermined spring com-

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pressing quantity regardless of the variation of pressure in the pipe 61. Thus at the time that the trip rod 49 withdraws the bolt 42 from in front of the hammer 11 the hammer driving potential of the compressed spring 12 and the air pressure behind the piston 19 have both reached the desired hammer driving potential for driving the desired nail into the particular work. Upon release of the hammer by the detent means, the hammer accelerates rapidly through its single nail driving stroke, it being particularly noted with reference to Fig. 4 that the head of air behind the piston continues to drive the plunger 20 forwardly during the spring actuated power stroke of the hammer thus materially increasing the velocity of the hammer during said stroke and the impact delivered to the nail driven thereby.

I therefore obtain the required nail driving impact by utilizing a relatively light weight hammer by increasing the velocity with which the hammer is moved through its power stroke, said increase of velocity being attributable to the quick and positive expansile action of my compressed spring and the fact that the spring compressing motor continues to act on the spring to compress it during the hammer driving expansive action of the spring.

While the invention has been shown and described in what is considered to be a preferred form it is to be understood that the invention is not limited to the specific details thereof; as for example, the appliance is illustrated as a hand tool but it may be mounted upon a counter-balanced carriage for certain factory production operations; also the power means for compressing the hammer driving spring is shown in the drawings as a pneumatic motor but other fluid or mechanical motors may be used without departing from the scope of this invention.

What is claimed is:

1. In an appliance for driving fasteners such as nails or pins; an elongated tubular casing; means on one end of the casing for receiving and positioning successive fasteners; a hammer slidable in the casing for movement toward and away from said means; a plunger slidable in the opposed end portion of the casing; a coil spring located in the casing and having its respective ends fixed to the adjacent ends of said hammer and the said plunger; power means mounted on the casing and operatively connected to the plunger to compress the spring; detent means connected to the casing for locking the hammer in its inoperative position; and trip means movable with the plunger for releasing the detent means when a predetermined hammer driving potential has been built up in the spring to drive the hammer.

2. In an appliance for driving fasteners such as nails or pins; an elongated tubular casing; means on one end of the casing for receiving and positioning successive fasteners; a hammer slidable in the casing for movement toward and away from said means; a plunger slidable in the opposed end portion of the casing; a coil spring located in the casing and having its respective ends fixed to the adjacent ends of said hammer and the said plunger; a fluid pressure actuated motor mounted on the casing and operatively connected to the plunger to compress the spring; detent means connected to the casing for locking the hammer in its inoperative position; and trip means movable with the plunger for releasing the detent means when a predetermined hammer driving potential has been built up in the spring to drive the hammer.

3. In an appliance for driving fasteners such as nails or pins; an elongated tubular casing; positioning means on one end of the casing for receiving successive fasteners; a hammer slidable in said end of the casing for movement from an inoperative position toward said means and from the means to said inoperative position; a plunger freely slidable in the opposed end portion of the casing; an expansile coil spring located in the casing and having its respective ends fixed to the adjacent ends of the plunger and the hammer; a fluid pressure cylinder mounted coaxially on the said end portion of the casing; a pis-

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ton in the cylinder; a rod connecting the piston to the plunger; manually controlled means for alternately introducing pressure fluid to opposite sides of the piston to reciprocate the plunger through a power stroke and a return stroke; detent means mounted on the casing between the inoperative position of the hammer and the positioning means and adapted to arrest movement of the hammer toward said means; and trip means mounted on and movable with the plunger for releasing the detent means when a predetermined hammer driving potential has been built up in the spring.

4. In an appliance for driving fasteners such as nails or pins; an elongated tubular casing; positioning means on one end of the casing for receiving successive fasteners; a hammer slidable in said end of the casing for movement from an inoperative position toward said means and from the means to said inoperative position; a plunger freely slidable in the opposed end portion of the casing; an expansile coil spring located in the casing and having its respective ends fixed to the adjacent ends of the plunger and the hammer; a fluid pressure cylinder mounted coaxially on the said end portion of the casing; a piston in the cylinder; a rod connecting the piston to the plunger; manually controlled means for alternately introducing pressure fluid to opposite sides of the piston to reciprocate the plunger through a power stroke and a return stroke; detent means mounted on the casing between the inoperative position of the hammer and the positioning means and adapted to arrest the movement of the hammer at the initial position of its power phase; and trip means mounted on and movable with the plunger for releasing the detent means when a predetermined hammer driving potential has been built up in the spring and in the fluid pressure cylinder whereby upon release of the hammer the plunger will move forward under the action of the motor to add impetus to the power phase of the hammer.

5. In a single stroke appliance for driving fasteners such as nails or pins into a work mass, the combination of an elongated tubular casing; work positioning means on one end of the casing for receiving successive fasteners; a hammer reciprocable in the said casing end for movement from an inoperative position toward said means and from the means to said inoperative position; a plunger freely slidable in the opposed end of the casing; an expansile coil spring located in the casing and having its respective ends fixed to the adjacent ends of the plunger and the hammer; a fluid pressure cylinder mounted coaxially on the said opposed end of the casing; a piston movable in the cylinder; means for introducing pressure fluid into said piston cylinder to effect a power stroke and a return stroke for said piston; a rod connecting the piston to the plunger; detent means mounted on the casing between the inoperative position of the hammer and the positioning means and adapted to arrest the movement of the hammer toward said means, and trip means

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mounted on and movable with the plunger in position to release the detent means after the piston has moved through a major spring compressing portion of its power stroke to cause the piston to complete the remainder of its power stroke after release of the hammer by the detent means and drive the fastener into the work with the maximum force of the expansile spring.

6. In a single stroke appliance for driving fasteners such as nails or pins into a work mass as set forth in claim 5 characterized by the fact that the detent means is a laterally movable bolt spring pressed to arrest the movement of the hammer and having a tapered hole therethrough, and the trip means is a longitudinal rod adjustably mounted on the plunger and having a tapered end insertable into the tapered hole in the bolt to move the bolt from the path of the hammer.

7. In a single stroke appliance for driving fasteners such as nails or pins into a work mass, the combination of an elongated tubular casing; a fastener positioning means mounted on and projecting from one end of the casing and having a fastener positioning throughbore formed therein and a blunt work contacting surface positioned thereon at right angles to the said bore; a hammer slidable in the casing for movement from an inoperative position into engagement with the fastener positioning means and return to said inoperative position, said hammer including a rod like extension fixed thereto and receivable in and having the same length as the bore; a plunger slidable in the opposed end portion of the casing; a coil spring located in the casing and having its respective ends fixed to adjacent ends of the said hammer and the said plunger; power means mounted on the casing and operatively connected to the plunger to contract the spring; detent means connected to the casing for locking the hammer in its inoperative position; and trip means movable with the plunger for releasing the detent means when a predetermined hammer driving potential has been built up in the spring by the power means.

8. In a single stroke appliance for driving fasteners such as nails or pins into a work mass as set forth in claim 7 characterized by the fact that the fastener positioning means is mounted on the casing end for axial movement and that a longitudinally flexible means is provided between the casing and positioning means to maintain the positioning means in resilient operative position on the casing.

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