United States Patent

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[54] **SPRING-OPERATED FASTENER DRIVING DEVICE**
26 Claims, 14 Drawing Figs.

[52] **U.S. Cl.** **227/123,** 227/132
[51] **Int. Cl.** **B25c 5/06**
[50] **Field of Search** 227/120, 123, 125, 126, 127, 128, 132, 139, 146

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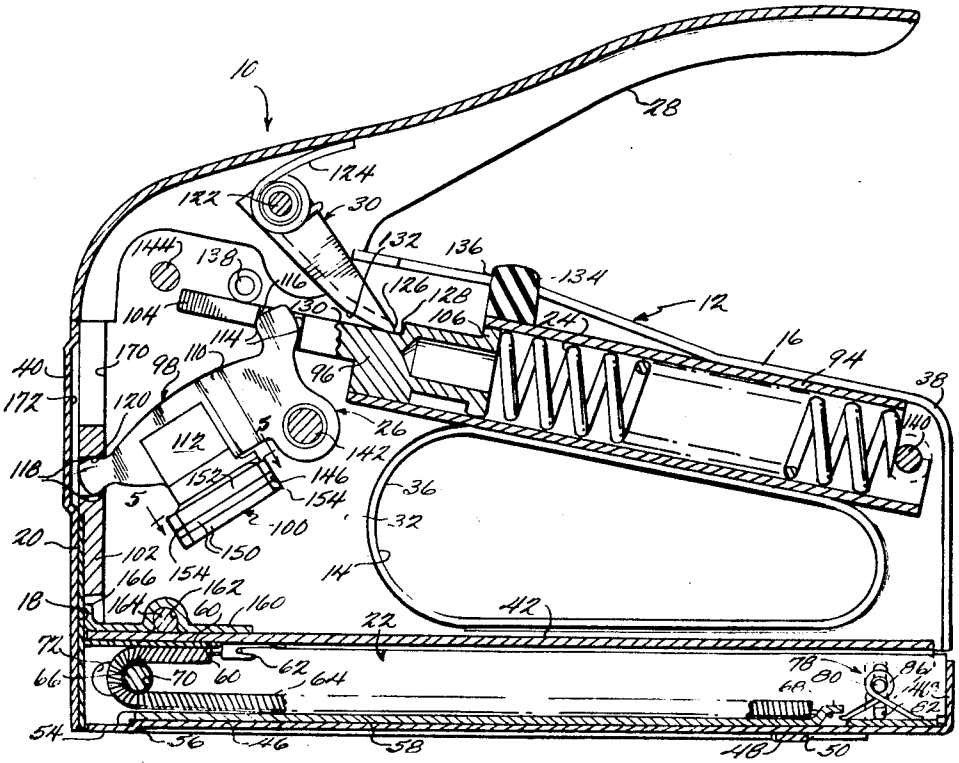
ABSTRACT: A fastener driving device including a housing providing a fastener drive track and an elongated hollow handle portion extending transversely with respect thereto within which an elongated drive spring is mounted in peripherally confined relation so as to enable the housing to have a low profile and to permit more efficient utilization of its spring energy to effect rapid fastener driving. The spring is compressed by movement of a spring actuated member thereagainst in response to the movement of an actuating lever and pawl through an actuating stroke, as by a manual gripping action between the actuating lever and the handle portion of the housing. The actuating lever and pawl having a togglelike action which increases the mechanical force transmission as the spring is progressively compressed. The spring actuated member is released at the end of the actuating stroke of the actuating lever so as to be moved through a spring actuated stroke by the compressed drive spring, which movement is transmitted to the fastener driving element of the device by means of a bellcrank in such a way that the drive stroke of the fastener driving element is through a greater distance and at a greater speed than the spring actuated stroke of the spring actuated member. Resilient bumper means disposed at an acute angle to the horizontal is provided for engaging the bellcrank and cushioning the end of the spring actuated stroke of the parts. A fastener magazine is provided to feed a fastener from a contained supply to the drive track to be driven by the fastener driving element during its drive stroke, the latter being normally biased into a position corresponding to the end of its drive stroke and being moved through a retraction stroke by the operation of the bellcrank when the actuating lever is moved through its actuating stroke. The fastener magazine includes a movable member which is slidable rearwardly to permit fasteners to be inserted in the magazine assembly from the bottom. The movable member is positively secured to a fixed member in operative position by means of a releasable locking pin mounted in slots in the movable member and resiliently biased into engagement with a notch in the fixed member. The parts constituting the fastener driving mechanism and its housing are constructed in a manner such that relatively few manipulative steps are required to assembly an operating embodiment.



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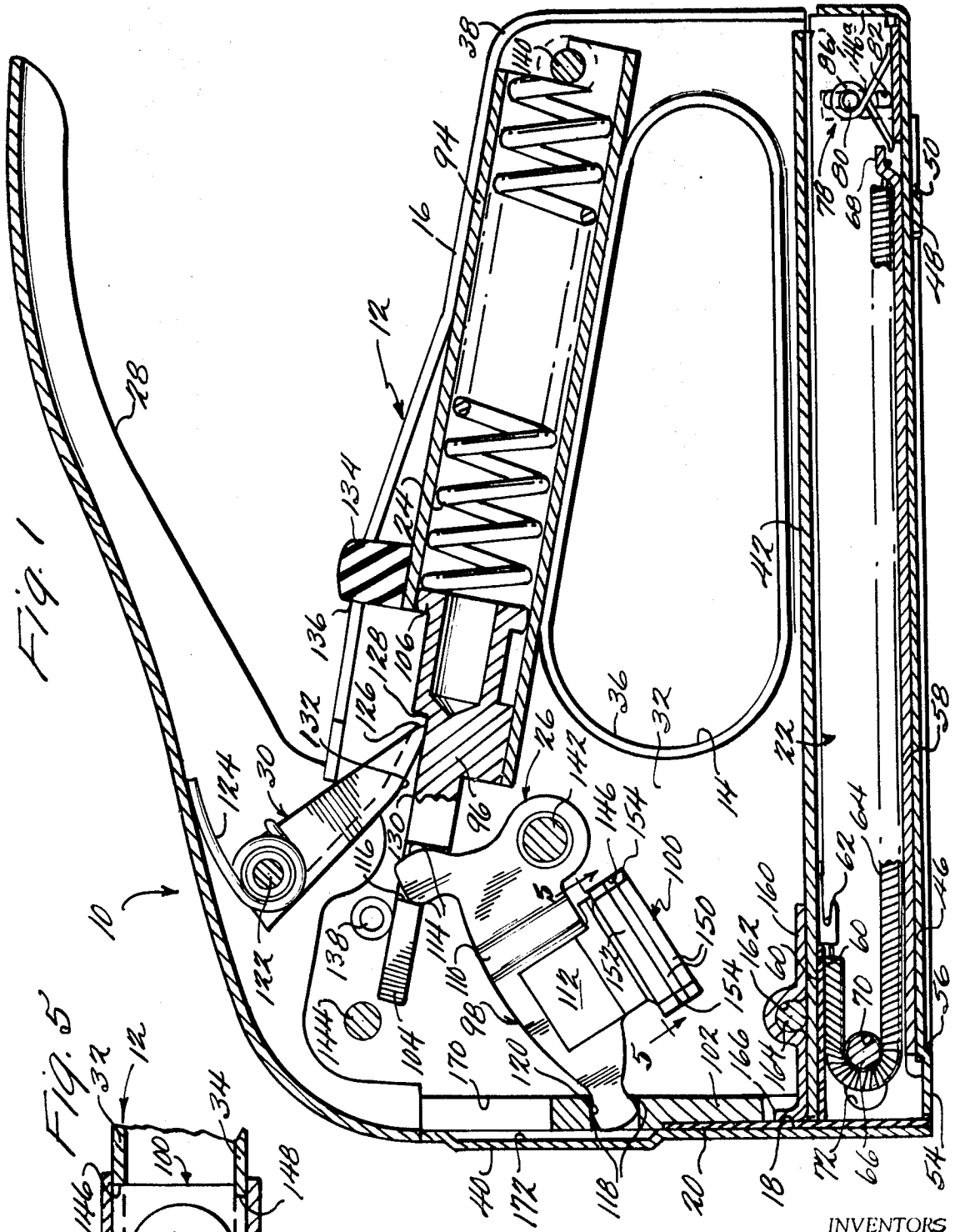

Fig. 1

Fig. 5

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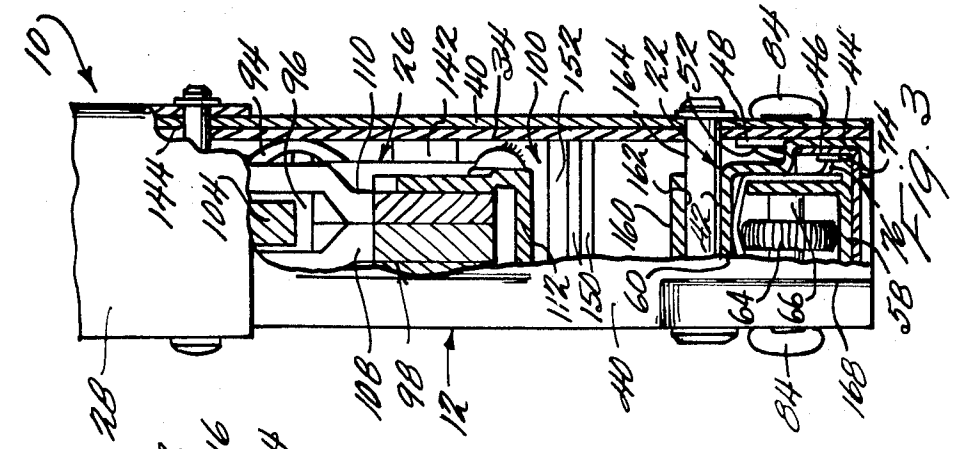

Fig. 3

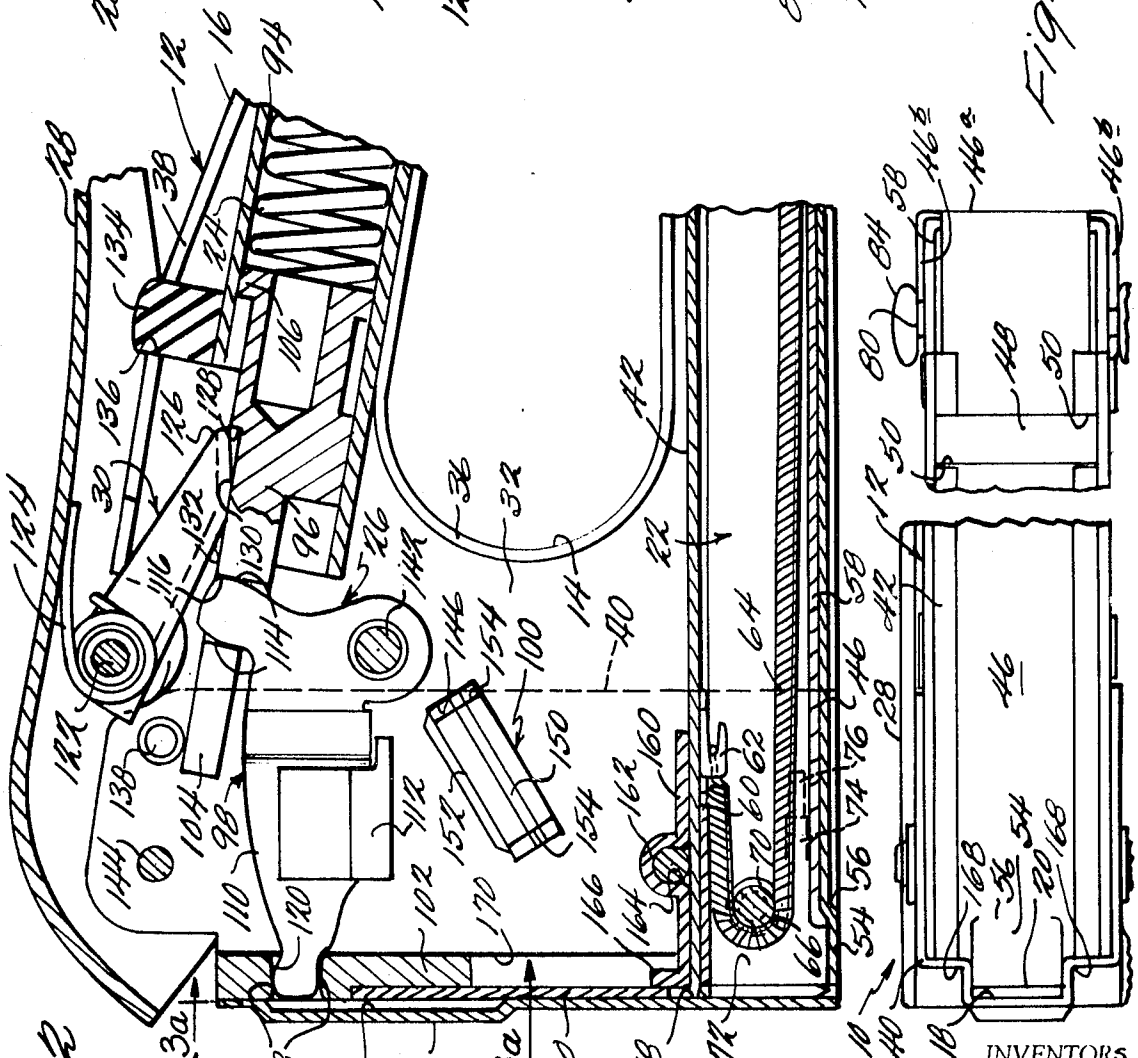

Fig. 2

Fig. 4

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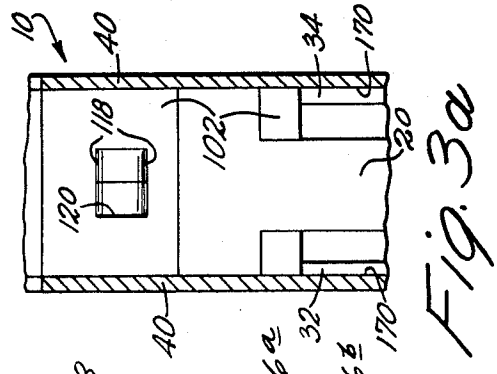

Fig. 3a

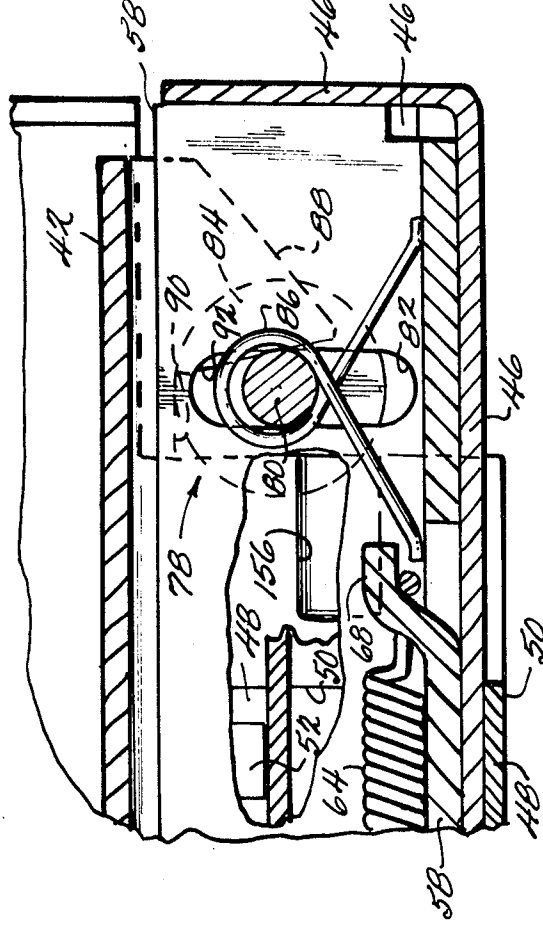

Fig. 6a

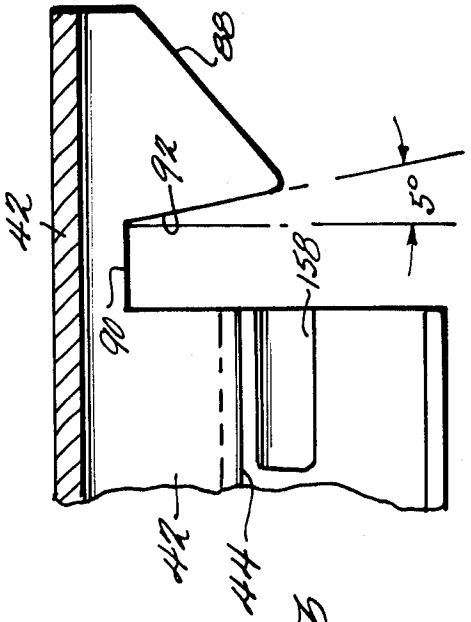

Fig. 6b

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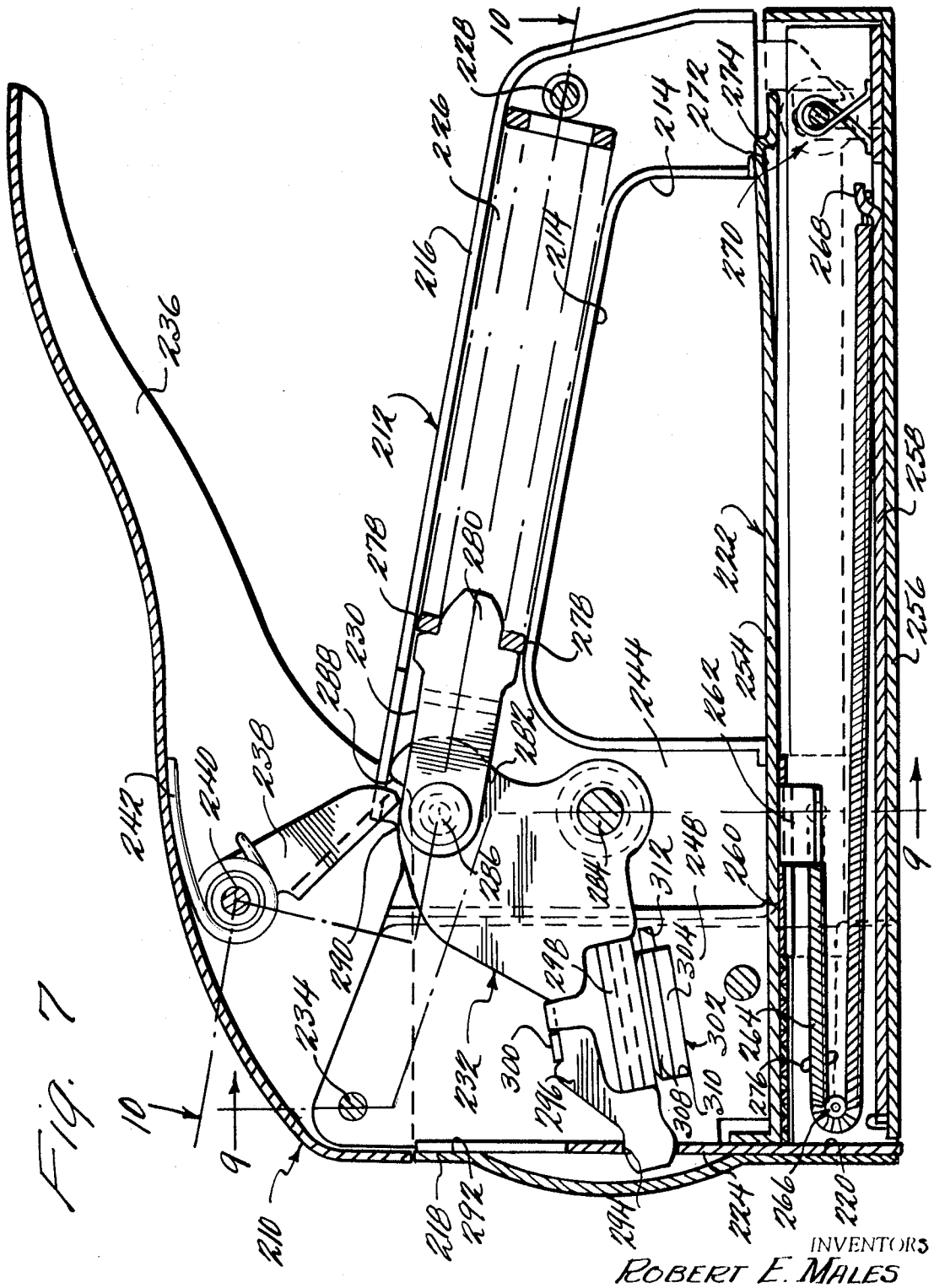

Fig. 7

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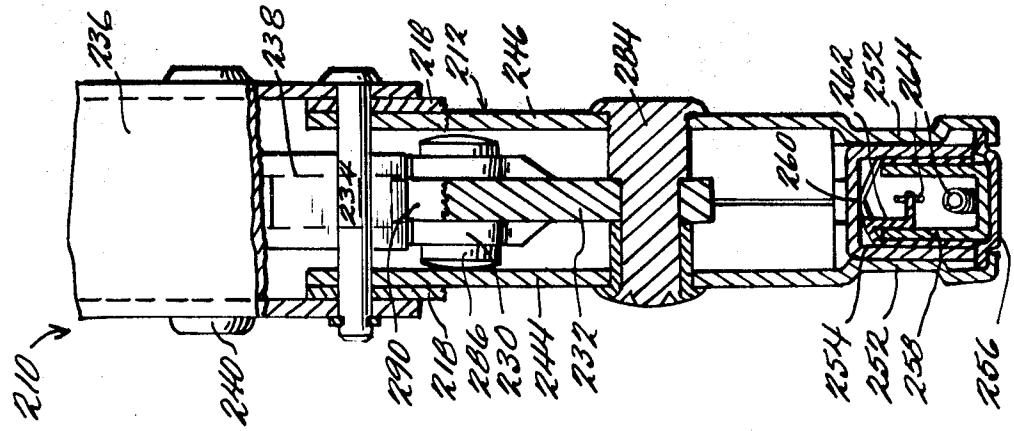
Fig. 9



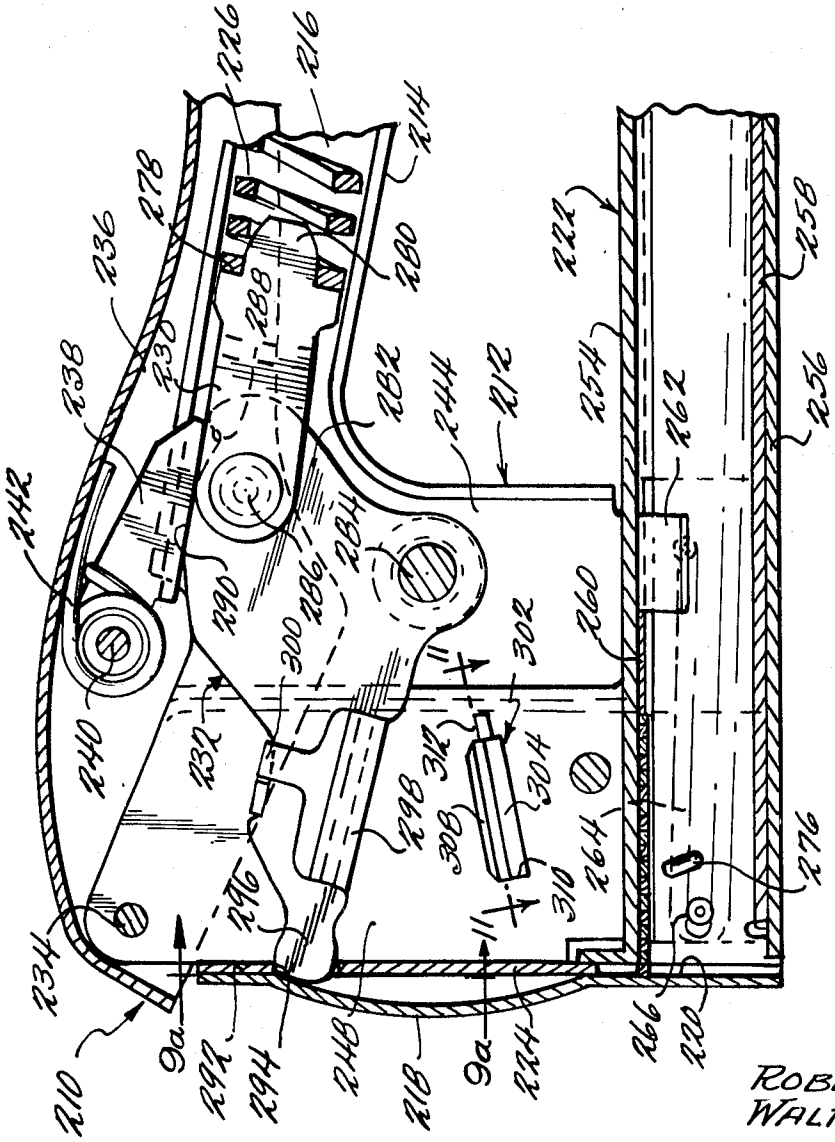


Fig. 8

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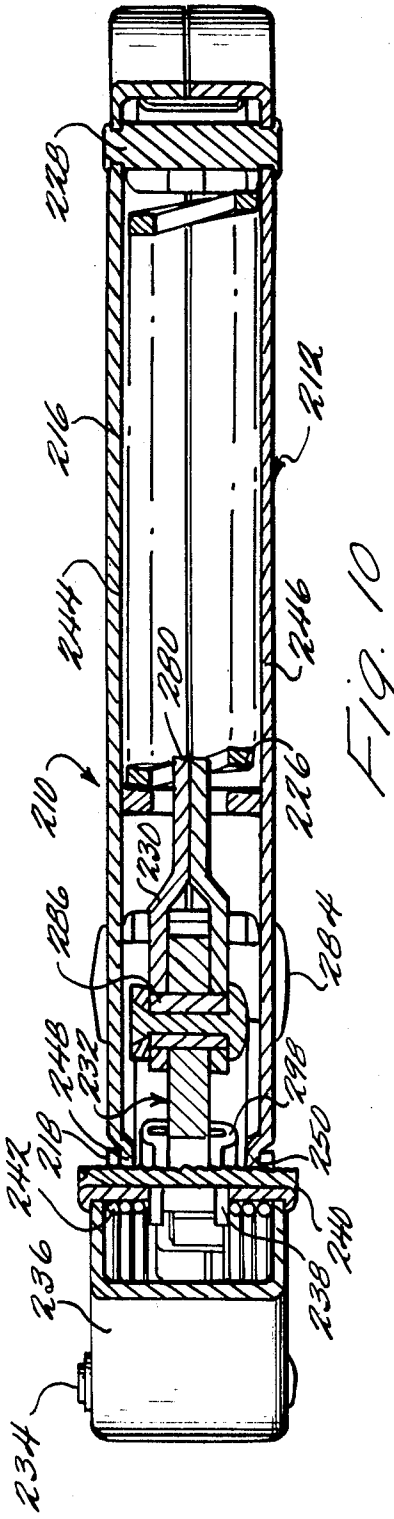

Fig. 10

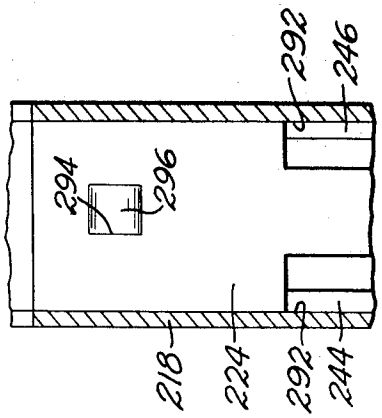

Fig. 9a

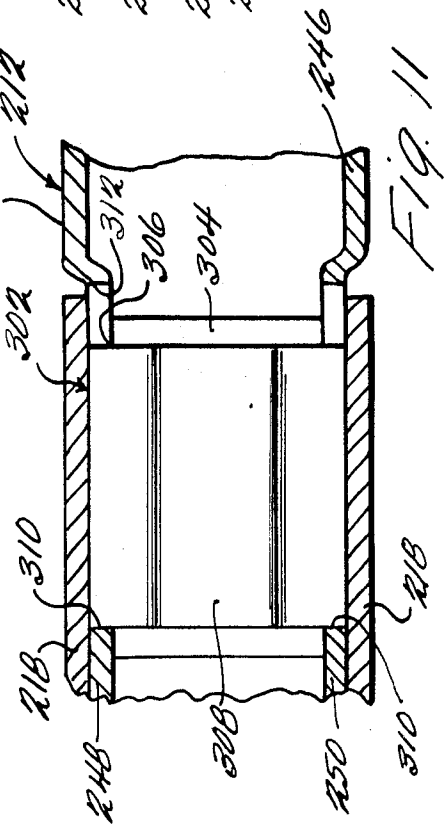

Fig. 11

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SPRING-OPERATED FASTENER DRIVING DEVICE

This invention relates to fastener driving and more particularly to a fastener driving device of the spring actuated type having improved means for effecting the drive stroke of the fastener driving element by the spring of the device.

Spring operated fastener driving devices are well known in the art and have been commercially available for a number of years. A conventional commercially available device of this type usually includes a fastener driving element which is moved by a spring action through a drive stroke to strip a fastener from a fastener package carried by a magazine of the device and to drive the stripped fastener into a workpiece. The spring action is accomplished in these devices by means of a coil spring which is directly connected to the fastener driving element in longitudinal alignment therewith.

In normal operation, the operator squeezes an actuating member to move the actuating member through an actuating stroke. This movement of the manually operated actuating member is transmitted to the driver element to move the latter from a normal at rest position through a retraction stroke during which the end of the fastener driving element is retracted within the drive track to a position permitting feeding movement of a staple or the like within the drive track from the magazine. Also during the retraction stroke, the coil spring is compressed and at the end of the retraction stroke the fastener driving element is released so that it will be rapidly moved through its drive stroke by the compressed coil spring acting directly thereon.

While devices of this type have proven satisfactory in operation, one disadvantage inherent in the commercial devices is that the direct acting spring arrangement necessitates a relatively high profile. The high profile can be an operational disadvantage where the device must be used in close space conditions and, in addition, is not the most efficient design in terms of overall weight and bulkiness.

It is an object of the present invention to provide a fastener driving device in which the driving spring is mounted within the hollow handle portion of the housing in peripherally confined relation so as to insure maximum compactness and lightness while at the same time providing for a more efficient utilization of the spring energy in effecting a rapid drive stroke of the fastener driving element. In accordance with the principles of the present invention, the driving spring mounted within the housing handle portion is arranged to effect the movement of the fastener driving element through a motion transmitting mechanism which is operable to move the fastener driving element through a drive stroke which is greater in speed and distance than the drive stroke of the spring and the corresponding stroke of the spring actuated member, the spring actuated stroke of the parts being arrested by a resilient bumper means engageable by the motion transmitting mechanism.

Another object of the present invention is the provision of a fastener driving device of the type described embodying a novel combination of component parts, each of which is of a simple durable construction capable of economic manufacture, the combination of component parts being capable of assembly into a highly efficient compact but lightweight device in a simple and economical fashion, and when assembled, being capable of extended operation in a highly efficient manner without the necessity of costly repairs and maintenance.

A further object of this invention is to provide a locking mechanism which will reliably secure a movable member in the magazine assembly to a fixed member so that forces transmitted rearwardly through the magazine will not accidentally release the movable member from engagement with the fixed member. Such a locking mechanism, however, must be manually releasable with little effort to permit easy loading of fasteners into the magazine.

These and other objects of the present invention will become more apparent during the course of the following detailed description and appended claims.

The invention may best be understood with reference to the accompanying drawings wherein an illustrative embodiment is shown.

In the drawings:

FIG. 1 is a vertical sectional view of one form of a fastener driving device embodying the principles of the present invention, showing the parts in their normal inoperative position;

FIG. 2 is a fragmentary view similar to FIG. 1 showing the parts at the beginning of the drive stroke of the fastener driving element;

FIG. 3 is a fragmentary front elevational view of the device with parts broken away for purposes of clearer illustration;

FIG. 3*a* is a fragmentary sectional view taken along the line 3*a*—3*a* of FIG. 2;

FIG. 4 is a fragmentary bottom view of the device;

FIG. 5 is a fragmentary sectional view taken along the line 5—5 in FIG. 1;

FIG. 6*a* is a fragmentary, somewhat magnified, vertical sectional view of the rear portion of the magazine assembly illustrating the structural details of the locking mechanism;

FIG. 6*b* is a fragmentary view of FIG. 6*a* showing the notch in the fixed member which receives the locking pin;

FIG. 7 is a view similar to FIG. 1 of a modified form of fastener driving device embodying the principles of the present invention;

FIG. 8 is a view similar to FIG. 2 of the device shown in FIG. 7;

FIG. 9 is a sectional view taken along the line 9—9 of FIG. 7;

FIG. 9*a* is a fragmentary sectional view taken along the line 9*a*—9*a* of FIG. 8;

FIG. 10 is a sectional view taken along the line 10—10 of FIG. 7; and

FIG. 11 is an enlarged fragmentary sectional view taken along the line 11—11 of FIG. 8.

Referring now more particularly to FIGS. 1 and 2 of the drawings, there is shown therein one form of a fastener driving device, generally indicated at 10, embodying the principles of the present invention.

As a convenience, the device will be described in an orientation operable to drive fasteners downwardly into a horizontal workpiece, although it will be understood that the device is not limited to such application but can be used to drive fasteners in vertical workpieces or beneath horizontal workpieces, as well as workpieces of any other orientation. Consequently, it will be understood that terms such as "vertical," "horizontal," "above," "below," etc. are to be construed in their relative sense.

The device 10 includes a housing assembly, generally indicated at 12, which is formed with a hand-receiving opening 14 defining thereabove an elongated handle portion 16. The housing assembly 12 also includes structure defining an elongated vertical fastener drive track 18 which extends in a direction transverse with respect to the handle portion 16. A fastener driving element 20 is mounted for movement within the drive track 18 from a normal at rest or first position through a retraction stroke into a retracted or second position, and from the second position through a drive stroke into the first position. Mounted within the housing structure at a position below the hand opening 14 and extending in a direction normal to the drive track is a fastener magazine assembly, generally indicated at 22, operable to support a supply of fasteners, such as staples or the like, and to feed a fastener from the supply into the drive track 18 to be driven outwardly thereof into a workpiece by the fastener driving element 20 during the drive stroke thereof.

In accordance with the principles of the present invention, elongated drive spring means 24 is mounted within the housing handle portion 16. The spring means 24 is operable, through a motion transmitting mechanism generally indicated at 26, to effect the drive stroke of the fastener driving element 20 in response to the movement of an actuating member 28, as by a manual gripping action of the actuating member and the

housing handle portion 16 with the fingers of the operator extending through the housing opening 14. When the operator moves the actuating member 28 from its normal inoperative position through an actuating stroke into an operative position, the spring means 24 and motion transmitting mechanism 26 are moved through a spring stressing stroke, which, in turn, effects movement of the fastener driving element 20 through its retraction stroke. When the actuating member 28 reaches its operative position, as shown in FIG. 2, the motion transmitting mechanism 26 and spring means 24 are released so as to effect a spring actuated movement of the fastener driving element 20 through its drive stroke. In order to accomplish the above movements in response to the actuating movement of the actuating member 28, there is provided a spring stressing and releasing mechanism, generally indicated at 30, which is carried by the actuating member 28 and operatively connected with the motion transmitting mechanism 26.

Referring now more particularly to FIGS. 1–4, the housing assembly 12 preferably includes a pair of main housing parts 32 and 34. These parts are preferably of stamped metal, each part being a substantial mirror image of the other. As shown, the peripheral edge portions of the parts defining the hand opening 14 are turned inwardly, as indicated at 36, and the upper and rearward peripheral edges are likewise turned inwardly, as indicated at 38.

The housing parts are adapted to be secured together in mating relation to each other with the inwardly turned edges 36 and 38 on housing parts 32 and 34 in adjacent relation. The forward edge portions of the main housing parts 32 and 34, when disposed in mating relation, define an open nose portion of the device and the housing assembly includes a nose cap 40 of generally U-shaped cross-sectional configuration with the legs thereof extending inwardly over main housing parts 32 and 34 adapting the nose cap to fit over and close the nose portion of the housing.

In a like manner, the lower portion of the housing parts 32 and 34, when secured together in mating relation, is open so as to detachably receive therein the magazine assembly 22.

It is within the contemplation of the present invention to utilize magazine assemblies of any well-known construction. However, a magazine assembly having a construction and operation as hereinafter described is preferred, due to the facility with which it can be assembled within the device and other operational features which will now be described. It will be understood that the magazine assembly of the present invention is not limited in its applicability to a spring driven fastener driving device of the present invention but would have applicability in other fastener driving devices including pneumatically operated fastener driving devices.

As shown, the magazine assembly 22 includes an elongated fixed frame member 42 of inverted generally U-shaped cross-sectional configuration extending substantially the length of the housing with the legs thereof bent outwardly and then inwardly along their lower portions so as to form inwardly opening elongated channels 44. The magazine assembly further includes an elongated movable member 46 U-shaped in cross section having upright legs of a size which will slidably engage with elongated channels 44.

The movable magazine frame member 46 adapted to be received in channels 44 is thus guided for longitudinal sliding movement by the fixed magazine frame member for movement between an operative position, as shown in FIGS. 1 and 2, wherein the movable magazine frame member disposed within the fixed magazine frame member and an inoperative or loading position wherein the movable magazine frame member extends rearwardly and outwardly of the fixed magazine frame member, thus exposing the open bottom of the fixed magazine frame member.

In order to limit the outward movement of the movable magazine frame member there is provided a U-shaped stop strap 48 which is adapted to engage within slots 50 cut out of the rearward end portion of the fixed magazine member 42 in the lower portion of the legs defining the channels. The upper ends of the legs of the stop strap 48 have tabs 52 struck therefrom which extend inwardly and engage over the adjacent portion of the fixed frame member to retain the stop strap in position, as best shown in FIG. 3. The lower forward portion of the movable magazine frame member is formed with a depressed portion 54 defining a rearwardly extending abutment 56 which is adapted to engage the bight portion of the stop strap 48 when the movable magazine frame member is moved outwardly into its loading position.

Fixedly secured to the movable magazine frame member 46, as by welding or the like, is an elongated staple guide or core member 58 which, as shown in FIG. 3, is of generally U-shaped cross-sectional configuration. Slidably mounted on the upper edges of the legs of the guide member 58 is a fastener pusher member 60 which is also of U-shaped configuration and has a depending tab 62 struck from the central rearward portion thereof. The tab 62 has connected thereto one end of an elongated coil spring 64 which serves to resiliently bias the pusher member forwardly toward the drive track 18. The spring 64 extends forwardly around a guide roller 66 and then rearwardly and has its opposite end connected with an upturned tab 68 struck from the rearward portion of the core member 58. The roller 66 is preferably in the form of a cylinder having a spring receiving groove 70 formed in the exterior periphery at the central portion thereof. The ends of the roller are of reduced diameter to engage within the rearward end of tear-shaped openings 72 formed in the legs of the core member adjacent the forward end portion thereof. With this construction, the roller 66 is assembled by inserting it transversely through the large end of the openings and then moving it rearwardly so that the reduced ends of the roller will engage within the smaller rearward portion of the tear-shaped openings. The biasing force of the spring 64 retains the roller in engagement with the rear end of the tear-shaped openings.

In order to limit the forward movement of the pusher 60, the legs of the movable magazine frame member 46 adjacent their forward extremities have stop tabs 74 struck therefrom which are disposed in a position to engage outwardly turned tab portions 76 of the pusher member, as shown in FIG. 3.

In accordance with the principles of the present invention, the magazine assembly 22 is provided with a releasable locking mechanism, generally indicated at 78 and more clearly shown in FIG. 6*a*, which is operable to resiliently bias the movable magazine frame member forwardly into its operative position and to positively retain the same against movement rearwardly out of its operative position. As shown, the locking mechanism comprises a locking pin 80 which extends through elongated vertical openings 82 formed in the legs of the core member 58. As shown in FIG. 4, the rearward end portion of the movable magazine frame member 46 has its vertical legs cut off and the bight portion of the frame member is turned upwardly at 46*a* and is provided with a pair of side tabs 46*b* which are bent forwardly. The outer ends of the locking pin are provided with manually engageable knobs 84 by which the locking pin is disengaged to unlock the movable magazine frame member for movement from its operative position into its loading position.

The locking pin is resiliently biased upwardly by suitable spring means which, as shown, is in the form of a coil spring 86 having opposite ends extending downwardly in opposite directions and disposed in engagement with the adjacent surface of the bight portion of the core member.

As best shown in FIGS. 4 and 6*b*, it will be noted that the housing parts adjacent their lower rearward end portions are cut out and that the rearward end portion of the fixed magazine frame member 42 is formed with an upwardly and forwardly extending locking pin camming surface 88 and an upwardly extending locking pin receiving notch 90. The forwardly facing surface 92 of the notch 90 extends downwardly and rearwardly to the notch opening at an angle of approximately 5° with respect to the vertical.

It will be understood that the magazine assembly is adapted to be loaded with fasteners such as a conventional stick of sta-

ples through the bottom. To load the magazine assembly, the operator need only to push down on the manually engageable knobs **84** to disengage the locking pin **80** from the notch **90**. By then pulling on the manually engageable knobs **84**, the movable magazine frame member **46**, the core member **58** fixed thereto and the resilient pusher structure carried by the latter will be moved rearwardly and outwardly into a loading position wherein the bottom of the fixed magazine frame member is open. The upper portions of the legs of the fixed magazine frame member **42** are of a size to receive the particular size of staple stick which is simply dropped into the fixed magazine frame member with the device held in an inverted position. After the staple stick has been loaded within the fixed magazine frame member, the operator then simply pushes the movable subassembly from its loading position inwardly and forwardly toward its operative position. During this movement the pusher will engage the trailing staple of the stick and its movement will be arrested. Subsequent movement merely results in the extension of the feeding spring **64**. As the movable subassembly approaches its operative position, the locking pin **80** first engages the inclined camming surfaces **88** which are disposed at approximately a 45° angle and serve to cam the locking pin downwardly so that it will pass into the notches **90**. When the locking pin passes into the notches, it is biased upwardly by the spring **86** within the vertical slots **82**. This upward spring biased movement of the locking pin engages the rearward surface of the locking pin with the forwardly facing surfaces **92** of the notches which are inclined upwardly and forwardly. By this engagement the movable subassembly is resiliently urged forwardly into its operative position. It will be noted, however, that because of the very slight angular inclination of the forwardly facing surfaces of the notches (preferably less than 7½° and of the order of 5°), once the locking pin assumes a vertical position within the notch the locking pin can not be moved downwardly by forces transmitted in a rearward direction through the movable subassembly. It is to be noted that the same result can be achieved by inclining slot **82** while making notch **90** vertical. Thus, the locking pin mechanism **78** serves to resiliently bias the movable subassembly of the magazine into its fully operative position and to positively prevent movement away from that position until the locking mechanism is manually actuated.

The elongated spring means **24** is preferably in the form of a compression coil spring housed within an elongated guide tube **94**. The motion transmitting mechanism **26** preferably includes a spring-actuated member **96**, a bellcrank member generally indicated at **98**, a resilient bumper assembly generally indicated at **100**, and a fastener driving element receiving guide member **102**.

Spring-actuated member **96** is shaped from a cylindrical metal piece and has a rectangular cross section portion **104** integral therewith and extending forwardly therefrom providing upper and lower flat surfaces. The rearward cylindrical portion of the spring-actuated member **96** includes an annular flange **106**, the periphery of which slidably engages the interior of tube **94** and the rear surface of which engages the forward end of spring **24**.

Bellcrank member **98** may be of any suitable construction and, as shown, is preferably made up of two metal stampings **108** and **110** which are held together by a yoke **112** secured to the stampings **108** and **110** by any suitable means, such as welding or the like. The portion of the bellcrank **98** to which the yoke **112** is attached constitutes a generally horizontally extending bellcrank arm. At a position rearwardly of the yoke **112**, the stampings **108** and **110** are bent outwardly so as to provide a generally vertically extending bellcrank arm of bifurcated configuration. The upper extremities of the bifurcated vertically extending arm are provided with opposed arcuate cam surfaces **114** adapted to engage within the end surfaces defining a pair of transversely spaced openings **116** formed in the rectangular portion **104** of the spring-actuated member **96**. The forward end of the horizontally extending bellcrank arm is likewise provided with opposed cam surfaces **118** which, in turn, are adapted to engage the top and bottom surfaces defining a horizontally extending opening **120** formed in the guide block **102**.

The actuating lever **28** is of stamped metal having a generally inverted U-shaped cross-sectional configuration. The pawl **30** likewise is formed of a metal stamping which is of generally U-shaped cross-sectional configuration. The upper forward end of the pawl is apertured to receive the central portion of a pivot pin **122** which extends through the legs of the actuating lever at a position intermediate the ends thereof. A U-shaped spring **124** is mounted with its bight portion extending over the upper rearward surface of the pawl **30** and has the intermediate portion of its legs coiled about the pivot pin **122** and the extremities of the legs engaged beneath the bight portion of the actuating lever **28**.

As best shown in FIGS. **1** and **2**, the pawl includes an outer end portion **126** which is adapted to cooperate with a forwardly extending abutment **128** formed on the upper central surface of the spring-actuated member **96**. Extending forwardly from the abutment **128** is a flat cam surface **130** which is adapted to cooperate with a convexly angular cam surface **132** provided on the under side of the pawl **30**.

ASSEMBLY

While the principles of the present invention may be carried out with component parts of widely variant construction, the particular construction of the component parts described above is of significance, in view of the facility by which they can be assembled into an operative device. In assembling the device **10**, the spring **24** mounted within the tube **94** is first placed within the handle cavity within one housing part, as for example, the part **32**. A resilient stop button **134**, of generally T-shaped cross section, is engaged within an appropriate opening **136** in the upper inwardly turned marginal edge portion **38** of each housing part. Spring-actuated member **96** is then inserted into the forward end of the tube with the flange **106** thereof engaging the forward end of the spring. In addition, a guide roller assembly **138** is positioned within an opening adjacent the forward upper end of the housing part **32**, there being a corresponding opening in the housing part **34**. The guide roller assembly **138** is adapted to engage the upper flat surface of the spring-actuated member **96** to assist in the longitudinal sliding movement thereof during the operation of the device. Bellcrank member **98** is then moved into a position such that the cam surfaces **114** engage within the openings **116**.

With the component elements assembled in the manner indicated above within the housing part **32**, the housing part **34** is then disposed in mating relation with the housing part **32** enclosing the component elements as above referred to. The component parts are then secured in proper relation by inserting a pin **140** through appropriate openings formed in the rearward upper portions of the housing parts, which pin extends through appropriate openings in the rearward end of the tube **94** and engages the rearward end of the spring **24**. A pivot pin assembly **142** is then engaged within suitable openings in the central forward portion of the housing parts and an appropriate opening in the rearward lower portion of the bellcrank **98**. The pivot pin **142** provides a pivotal axis for the bellcrank **98**. The pin assemblies **140** and **142** are then properly secured as by riveting or the like to retain the housing parts in mating relation with the above described component elements properly mounted therein. Next, the nose cap **40** is fed over the forwardly open nose portion of the housing parts, so that its apertured upstanding upper end portions register with the apertured upper end portions of the housing parts. The actuating lever **28** with the cocking and releasing pawl **30** pivotally mounted thereon is fed over the upper portion of the nose cap until apertures formed in the forward leg portions thereof are disposed in alignment with the aforesaid apertures of the nose cap and housing parts. A removable pin assembly

144 is then inserted through the registering apertures and releasably locked in place.

When the removable pin assembly 144 has been mounted in the manner indicated above, it will be noted that the actuating lever 28 is capable of being moved through its operative stroke and the nose cap 40 can be pivoted with the actuating lever with respect to the housing parts 32 and 34 from its normal operative position, as shown in FIGS. 1 and 2, in a clockwise direction as viewed therein into an open access position when the actuating lever is depressed. It will also be noted that by depressing the actuating lever 28 partially through its actuating stroke, the bellcrank 98 will be pivoted by the pawl 30 in a clockwise direction as viewed in FIG. 2. This pivotal movement is accomplished through the rearward movement of the spring-actuated member 96 by engagement of the outer end 126 of the pawl 30 with the abutment 128 and the engagement of the cam surfaces 114 with the openings 116 of the spring-actuated member 96.

With the actuating lever maintained in position partially toward its operative position and the nose cap pivoted into its open access position, the central nose portions of the housing parts 32 and 34 are exposed. As best shown in FIG. 5, the housing part 32 has a rectangular opening 146 formed therein and the housing part 34 has a registering opening 148 formed therein of a somewhat smaller length dimension. As can be seen from FIG. 5, the bumper pad assembly may include a pair of lower metal plates 150 and an upper resilient pad 152 of rubber or the like. The plates 150 and pad 152 are of identical peripheral configuration in plane, being generally of rectangular configuration with the corners of one side cutoff as indicated at 154. With this construction, the bumper pad assembly can be moved laterally through the opening 146 until the leading lateral end with the cutoff corners 154 engages within the opening 148. The lower portion of the surfaces defining the openings 146 and 148 thus serve as support means for the bumper pad assembly 100 which position the bumper assembly within the path of movement of the bellcrank 98 so as to be engaged by the lower surface of the yoke 112.

Next, with the actuating lever 28 still partially depressed and the nose cap in its open access position, the upper T-shaped end of the fastener driving element 20 is engaged with a corresponding T-shaped opening in the forward surface of the guide block 102 and these elements are moved toward the forward edges of the housing parts under the open nose cap 40 until the opening 120 therein receives the cammed surfaces 118 of the bellcrank 98. The actuating lever 28 can then be released causing the nose cap to pivot in a counterclockwise direction as viewed in FIG. 1 into its operative position due to the interengagement between the lower forward surface of the actuating lever 28 and the upper forward surface of the nose cap. As will be noted from FIG. 5, when the nose cap 40 is moved into its operative position, the leg portions thereof which overlap the nose nose portion of the housing parts 32 and 34 extend over the openings 146 and 148, thus retaining the bumper assembly 100 against lateral movement outwardly of the openings and in operative supported relation within the openings. Moreover, it will be noted that the position of the bumper assembly 100 is such that the yoke 112 will engage the same while the spring 24 is still in a stressed condition.

Next, the magazine assembly 22 is engaged within the lower portion of the housing parts 32 and 34, although it will be understood that this order of mounting the magazine assembly within the housing parts is not critical. In connection with the mounting of the magazine assembly within the housing parts, it will be noted with reference to FIG. 6*a* that the rearward end portions of the housing parts adjacent the rearward cutout portions thereof are formed with outwardly extending projections which define inwardly facing channels 156. At a corresponding position, the legs of the fixed magazine section 42 are formed with cooperating projections 158, best shown in FIG. 6*b*, which are adapted to engage the channels 156 when the magazine assembly 22 is moved forwardly into proper position within the housing parts.

The upper forward portion of the fixed magazine member 42 has a mounting strap 160 fixedly secured thereto as by welding or the like, which is provided with a channel 162 for receiving a removable pin assembly 164. The removable pin assembly 164 also serves to retain the nose cap 40 into its operative position, the latter having appropriate openings to receive the pin assembly 164 as well as the housing parts.

It will be noted that the forward end of the mounting strap 160 is bent upwardly, as indicated at 166, so as to define an upper rearward portion of the drive track 18. The lower bight portion of the nose cap is formed with inwardly bent corner portions 168, the interior surfaces of which define the sides of the drive track, the interior of the bight portion extending therebetween defining the forward surface of the drive track. The upper portion of the nose cap above the inwardly bent corner portions 168 define with the forward edges of the housing parts 32 and 34 a vertical guide track 170 within which the guide block 102 is mounted for vertical sliding movement. The upper central bight portion of the nose cap may be appropriately embossed outwardly, as indicated at 172, to provide clearance for the free end of the forwardly extending arm of the bellcrank 98.

The foregoing assembly arrangement whereby nose cap 40 and magazine assembly 22 are secured to housing 12 by a common removable pin means facilitates production and assembly of fastener driving devices capable of handling a variety of fastener sizes using the same basic components. In order to convert a production run of the fastener size to another, it is necessary only to substitute a different magazine assembly capable of accommodating the new size fastener, a different nose cap in order to provide a drive track of the proper size and a new driver element of the proper stroke length and cross-sectional area. Furthermore, because of the simplicity of construction discussed hereinabove, it is feasible for a user of the fastener driving device constructed according to the principles of this invention to make the aforementioned changes readily while operating the device in the field.

DESCRIPTION OF OPERATION

Referring now more particularly to FIG. 1 of the drawings, the parts of the device 10 of the present invention are shown in their normal at rest position. It will be noted that the bellcrank member 98 is disposed in engagement with the bumper assembly 100 and that the fastener driving element 20 is disposed in its first or extended position wherein the lower driving surface thereof is adjacent the outer end of the drive track 18. To actuate the device, the operator grips the handle portion 16 and the actuating lever 28 in his hand by extending his thumb over the actuating lever and his fingers through the hand opening 14 provided by the housing parts. By applying a squeezing action, the actuating lever is depressed and moved through its actuating stroke. During this movement, the outer end 126 of the pawl 30 first engages the abutment 128 of the spring-actuated member so that upon further movement through the actuating stroke the spring-actuated member is moved rearwardly into the tube 94 compressing the coil spring 24. This movement of the spring-actuated member 96 likewise effects a clockwise movement of the bellcrank member 98 by virtue of the engagement of the cam surfaces 114 in openings 116. This clockwise movement of the bellcrank member likewise effects a retracting movement of the fastener driving element 20 and guide block 102 through the engagement of the cam surfaces 118 in the opening 118 of the guide block.

It will be noted that the rearward movement of the spring-actuated member 96 to compress the spring 24 is accomplished by a togglelike action of the actuating lever 28 and pivoted pawl 30. In this action the portion of the actuating lever extending between the pivot pins 144 and 122 constitutes one toggle link, while the pawl connected between pin 122 and abutment 128 constitutes the other link. This toggle action is of significance because a progressively greater leverage is applied to effect the progressively greater stressing resistance of the spring. In this way, the maximum squeezing

force required by the operator to stress the spring is reduced to a minimum.

When the actuating lever **28** reaches its operative position, the outer end of the pawl **30** is cammed out of engagement with abutment **128** by the cam surface **132** thereof engaging the cam surface **130** of spring-actuating member **96**. This disengagement of the pawl **30** releases the spring-actuated member **96**, allowing it to be moved in a forward direction by the compressed spring **24**. The forward motion of spring-actuated member **96**, propelled by spring **24**, causes bellcrank member **98** to rotate from the position shown in FIG. **2** counterclockwise, thereby causing guide block **102** and drive element **20** to be moved downward.

Because the horizontally extending arm of the bellcrank member **98** is of greater effective length, measured from the pivotal axis of pin **142** to the engaged cam surface **118**, than the effective length, similarly measured, of the vertically extending arm, fastener driving element **20** will be driven through a greater distance at a greater speed than is spring-actuated member **96**. In the embodiment described herein, the ratio of the effective lengths of the horizontal arm to the vertical arm is approximately two to one, with the result that the kinetic energy available at the driving element is approximately 4 times greater than the kinetic energy with which spring-actuated member **96** is driven forward by spring **24**.

The counterclockwise rotation of bellcrank member **98** is abruptly halted by the resilient bumper assembly **100** with the spring **24** still stressed. Yoke **112** provides a flat contact surface rigid with bellcrank member **98** to meet with the contact surface of resilient bumper pad **152**, spreading the impact force over a wider area. Preferably, the bumper assembly **100** is disposed at an angle with respect to the horizontal, such angle being approximately 30° as illustrated in FIGS. **1** and **2**. Where the bumper assembly is mounted at an angle to the horizontal, as shown, the force transmitted to the bumper assembly when impacted by the yoke **112** will include a vertical component and a horizontal component. The horizontal component is desirable in that it reduces the magnitude of the vertical recoil force which would be otherwise present in the event that the bumper assembly were disposed entirely in a horizontal plane.

It is preferred to place the bumper assembly **100** in the position described hereinabove so that the forces generated by the impact of bellcrank member **96** thereon will be transmitted not only in a desirable direction but through the more sturdy portions of the motion transmitting mechanism **26**. However, it is within the contemplation of the present invention to position the bumper assembly so as to engage other parts of the bellcrank member. The preferred position shown is desirable since it minimizes the shearing forces acting on connecting parts, such as those described above, because the forces generated by the impact of the bellcrank member with the bumper assembly will not be transmitted directly through the less sturdy connecting parts.

The device **10** shown in FIGS. **1–6** is particularly suited for more rugged use in driving relatively large fasteners. In FIGS. **7–11**, there is shown a fastener driving device **210**, embodying the principles of the present invention, which is particularly suited for use with relatively small fasteners. The device **210** illustrates certain modifications in the structure of the device **10** which are within the contemplation of the present invention. It will be understood, however, that these variations are illustrative only and that various other modifications within the spirit and scope of the present invention will be readily apparent to those skilled in the art.

Since the assembly and operation of the device **210** is similar to the device **10** previously described, the description which follows will deal in detail only with the areas of difference which exist between the two devices. The device **210** comprises the same basic components as the device **10** including a housing assembly **212** formed with a hand-receiving opening **214** defining thereabove an elongated handle portion **216**. The housing assembly **212** includes a nose cap **218** providing a drive track **220** in the lower portion thereof. A magazine assembly, generally indicated at **222**, is carried by the lower portion of the housing assembly **212** is horizontally extending relation, the forward end thereof cooperating with the drive track **220** to feed successive fasteners therein to be driven by a fastener driving element **224** during the drive stroke thereof.

Mounted within the hollow handle portion **216** is an elongated coil spring **226** having its rear end anchored to the housing, as by a rivet **228**, and its forward end connected with a spring-actuated member **230** forming a part of a motion transmitting mechanism, which also includes a bellcrank member **232**. Pivoted to the upper forward end of the housing assembly **212**, as by a removable pivot pin assembly **234**, is an actuating lever **236** which carries an actuating pawl, **238**, as by a pivot pin **240** and spring **242**.

The housing assembly **212** is similar to the housing assembly previously described in that it includes two mating or complementary housing parts **244** and **246**. The housing parts **244** and **246** differ from the housing parts previously described in that the forward nose portion of the housing parts are offset inwardly as indicated at **248** and **250**. Moreover, each housing part includes an integral elongated horizontally extending lower portion **252** which forms a part of the magazine assembly **222**.

The magazine assembly **222** differs from that of the device **10** in that it is a fixed integral part of the housing assembly rather than being removably mounted with respect to the housing parts. The construction and operation of the magazine assembly **222** is otherwise similar to the magazine assembly **22** of the device **10** and includes an elongated magazine member **254** of generally inverted U-shaped cross-sectional configuration fixedly mounted, as by welding or the like, between the elongated portions **252**.

As best shown in FIG. **9**, the lower edges of the integral magazine portions **252** are turned inwardly and disposed in vertically spaced relation to the lower edges of the legs of the fixed magazine member **254** so as to define a pair of guide tracks for receiving the edges of a slidable magazine member **256**. Fixedly secured, as by welding or the like, to the upper central portion of the slidable magazine member **256** is a core member **258** of generally U-shaped configuration and of a size to receive on the upper portion thereof a supply of fasteners, such as a staple stick or the like. Slidably mounted on the upper portion of the core member **258** is a pusher member **260** having a depending L-shaped tab **262** struck from the central portion thereof to which is attached one end of a pusher spring **264**. The spring **264** extends forwardly from the tab **262** and around roller **266** removably journaled within a tear-shaped opening similar to the opening **72** previously described. The opposite end portion of the pusher spring **264** extends rearwardly and has its extremity anchored with a tab **268** struck from the central rearward portion of the bight of the core member **258**.

The movable magazine member **256**, the core member **258** and the spring urged pusher **262** carried thereby constitute a movable magazine structure which is slidable longitudinally between a rearwardly extending loading position and an inwardly telescoped operative position in a manner similar to the comparable structure of the magazine assembly **22** previously described. As before, a releasable locking mechanism, generally indicated at **270**, is provided for releasably locking the movable magazine structure in its operative position. The locking mechanism **270** is of the same construction and operation as the locking mechanism **78** so that a further detailed description thereof is believed unnecessary.

A difference in the magazine structure **222** from the magazine structure **22** exists in the manner in which the outward movement of the movable magazine structure is limited. As best shown in FIG. **7**, the upper rearward portion of the fixed magazine member **254** is relieved along its corners and has its upper wall formed with a slight incline rearwardly and upwardly as indicated at **272**. The rearward portion of the up-

wardly bent inclined portion 272 terminates in a vertical abutment surface 274.

Formed laterally inwardly in one of the legs of the core member 258 at a position spaced rearwardly from the forward end thereof is an abutment 276 which extends upwardly and forwardly in a position to engage the lower forward edge portion of the L-shaped tab 262 of the pusher 260. The spacing of the abutment from the forward end of the movable structure is such that when the last staple is moved into the drive track the tab 262 will engage the abutment and prevent movement of the pusher into the drive track. Moreover, because of the inclination of the projection 276 and the relative position of the connection of the pusher spring 264 with the tab 262, the entire pusher is biased by the spring to pivot in a counterclockwise direction as viewed in FIG. 7 about the projection 276 as a fulcrum. Consequently, as the pusher 260 approaches the inclined offset portion 272 during the outward rearward movement of the movable magazine structure, the rearward end of the pusher 260 follows the upwardly and rearwardly inclined surface and the rearward end of the pusher ultimately engages the abutment surface 274 to prevent further outward movement of the movable magazine structure. The corner relief provided in the upper rearward portion of the fixed magazine member 254 previously described provides access openings permitting manual lateral movement of the pusher 260 out of engagement with the abutment surface 274 to release the movable structure for outward separating movement beyond the loading position.

It will also be noted that insofar as the mounting of the spring 266 within the hollow handle portion 216 of the housing assembly is concerned, it differs somewhat from the mounting of the spring 24 within the housing of the device 10. Specifically, the guide tube 94 previously described is eliminated and the handle portion of the housing assembly is formed into a generally rounded corner square cross-sectional configuration which provides peripheral guiding confinement for the spring along both sides and its top and bottom.

The spring-actuated member 230 is mounted somewhat differently from the member 94 of the device 10 and generally is of a somewhat different construction. As best shown in FIGS. 7, 8 and 10, the spring-actuated member is formed from a pair of metal pieces having their rearward portions secured together in abutting relation, as by welding or the like, and formed with vertically spaced spring end abutting surfaces 278 and a central rounded extremity 280 extending rearwardly therefrom for engagement within the inner periphery of the spring 226. The forward end portion of the metal pieces comprising the spring actuated member are laterally outwardly offset to provide a forwardly extending bifurcated end for receiving therebetween an upwardly extending arm 282 of the bellcrank 232.

As best shown in FIG. 9, the bellcrank 232 is of a different construction than the bellcrank member 98 previously described and is made from a single plate of metal apertured to receive a shouldered rivet assembly 284 extending through appropriate openings in the central portion of the housing parts 244 and 246. The arm 282 of the bellcrank is pivoted to the bifurcated forward portion of the spring-actuated member 230, as by a sleeve bearing and rivet assembly 286, as best shown in FIG. 10.

The manner in which the pawl 238 is connected with the motion transmitting mechanism to move the latter in a direction to effect the retraction stroke of the driver element 224 differs from that of the pawl 30 previously described. Instead of cooperating with an abutment surface on the spring-actuated member, the outer end of the pawl 232 is adapted to engage an abutment 288 formed on the outer periphery of the bellcrank arm 282 at a position spaced slightly rearwardly of its pivot with the spring-actuated actuated member 230. The periphery of the bellcrank arm 282 extending forwardly from the abutment 288 is formed with a cam surface 290 which engages the under surface of the pawl during the operative movement of the pawl in engagement with the abutment 288 so that when the actuating lever moves into its operative position the cam surface 290 will pivot the pawl out of engagement with the abutment 288, as shown in FIG. 8, thus permitting the motion transmitting mechanism to move in a direction to effect the drive stroke of the fastener driving element 224.

The device 210 also includes a variation in the construction of the fastener driving element from that embodied in the device 10. As best shown in FIG. 8, the fastener driving element is formed from a single piece of metal, the lower portion of which cooperates with the guide track to drive the staple therethrough during the drive stroke of the fastener driving element and the upper portion of which provides a guiding function similar to the separate guide block of the device 10. The fastener driving element 224 is of generally T-shaped configuration in front elevation, the lateral upper ends of the T being slidably mounted within a guide track 292 formed by the forward inner portion of the nose cap 218 and the forward edges of the housing parts. As before, the upper central portion of the fastener driving element 224 is apertured, as at 294, to receive the outer end of a forwardly extending arm 296 forming part of the bellcrank 232.

Moreover, as before, forwardly extending arm 296 of the bellcrank member 232 has a striking yoke 298 secured thereto. The manner of securing the yoke to the arm is different, in that the yoke includes a pair of upstanding offset arms 300 which are bent around the upper surface of the arm to effect securement. Also, as before, the striking yoke 298 is adapted to engage a bumper assembly, generally indicated at 302.

The construction of the bumper assembly 302 is generally similar to the bumper assembly 100 previously described and, as best shown in FIGS. 8 and 11, includes a metal support plate 304 which is generally rectangular in plan with the corners thereof notched, as indicated at 306. The bumper assembly 302 also includes a resilient bumper pad 308 of rectangular configuration in plan, having a width equal to the overall width of the support plate 304 and a length equal to the length of the support plate between the corner notches 306.

The portions 248 and 250 of the housing parts are provided with openings 310 through which the bumper assembly 302 is assembled and which provide support means for maintaining the bumper assembly in operative relationship within the device. It will be noted that each opening 310 includes a main portion of generally rectangular configuration having a length generally equal to the length of the bumper pad 308 and a height generally equal to the combined thicknesses of the support plate 304 and bumper pad 308. Extending from one end of the main portion of each opening 310 is a centrally located access slot 312 of a length generally equal to twice the dimension of the notches 306 and of a height generally equal to the thickness of the support plate 304.

With this construction, the support plate 304 is first inserted laterally through one of the openings 310, the rearward portion of the plate passing through the associated slot 312. When the plate has been laterally moved into a position of lateral alignment, it is then moved forwardly so that the lateral edge portions thereof engage within the bottom of the main portion of the openings 310, the surfaces defining the bottom of the main portion of the openings serving to support the plate 304 in operative position. Next, the bumper pad 308 is moved laterally through the main portion of the opening 310 above the plate 304, to complete the assembly. It will be understood that when the nose cap 218 is moved into its operative position the legs of the nose cap effectively close the openings 310 and thereby positively secure the bumper assembly in its operative position, as can be clearly seen from FIG. 11. It will be noted that the operative position of the bumper assembly 302 is disposed at a somewhat different angle than the bumper assembly 100 previously described. Specifically, the bumper pad assembly 302 is disposed at an angle of approximately 12° with respect to the horizontal as compared with the 30° angle of the bumper pad assembly 100.

It thus will be seen that the objects of this invention have been fully and effectively accomplished. It will be realized, however, that the foregoing specific embodiment has been shown and described only for the purpose of illustrating the principles of this invention and is subject to extensive change without departure from such principles. Therefore, this invention includes all modifications encompassed within the spirit and scope of the following claims.

We claim:

1. A fastener driving device comprising:

a housing including means defining an elongated hollow handle portion and means disposed forwardly of said handle portion defining a fastener drive track extending in a vertical direction transverse with respect to said handle portion;

a fastener driving element mounted for movement within said drive track from a first position through a retraction stroke into a second position and from said second position through a drive stroke into said first position;

fastener magazine means carried by said housing below said handle portion for supporting a supply of fasteners and feeding a fastener from the supply into said drive track to be driven outwardly thereof by said fastener driving element during the drive stroke thereof;

an elongated coil spring mounted within the hollow handle portion of said housing with its rearward end anchored with respect to said housing and its outer periphery guidingly confined to permit longitudinal compression thereof by rearward movement of the forward end thereof;

a spring-actuated member operatively connected with the forward end of said spring mounted for rearward movement through a spring compressing stroke and for forward movement through a spring-actuated stroke;

a bellcrank member pivotally carried by said housing having first arm means operatively connected with said spring-actuated member in generally upwardly spaced relation to the pivotal axis of said bellcrank member and second arm means operatively connected with said fastener driving element in generally forwardly spaced relation to the pivotal axis of said bellcrank member for effecting the retraction stroke of said fastener driving element during the spring compressing stroke of said spring-actuated member and for effecting the drive stroke of said fastener driving element at a speed and for a distance greater than the speed and distance of the spring-actuated stroke of said spring-actuated member, during the latter;

an actuating lever pivoted at its forward end to the upper forward end of said housing for movement from a normal inoperative position through an actuating stroke into an operative position, as by a manual gripping action between said actuating lever and said handle portion;

a spring pressed pawl pivoted at one end to said actuating lever and having its opposite end operatively connected with one of said members for effecting movement of said spring-actuated member through its spring compressing stroke and hence said fastener driving element through its retraction stroke by said bellcrank member in response to the movement of said actuating lever through its actuating stroke and for releasing said members and said fastener driving element to permit said compressed spring to move said spring-actuated member through its spring-actuated stroke and said bellcrank member to move said fastener driving element through said drive stroke in response to the movement of said actuating lever into its operative position;

the pivotal axis of said pawl being related to the operative connection of its opposite end and to the pivotal axis of said actuating lever so as to define a togglelike linkage operative to progressively decrease the rate of movement of the spring compressing stroke of said spring-actuated member relative to the rate of movement of the actuating stroke of said actuating lever progressively during the latter so as to obtain a progressively increasing mechanical force transmission from said actuating lever to said spring-actuated member as said spring is progressively compressed; and

resilient bumper means carried by said housing in a position to engage the second arm means of said bellcrank member for resiliently arresting the spring-actuated movement of said bellcrank member and hence the spring-actuated member and fastener driving element operatively connected therewith when said fastener driving element has reached said first position during its drive stroke.

2. A fastener driving device as defined in claim 1 wherein the effective lengths of said first and second arm means have a ratio of the order of 2 to 1.

3. A fastener driving device as defined in claim 2 wherein said resilient bumper means comprises a bumper pad of resilient material.

4. A fastener driving device as defined in claim 3 wherein the surface of said bumper pad engaging said bellcrank is disposed at an acute angle with respect to the horizontal.

5. A fastener driving device as defined in claim 1 wherein said spring-actuated member is mounted for longitudinal sliding movement within said housing, and is provided with openings extending transversely therethrough on opposite sides thereof, said first arm means defining a bifurcated outer end portion engaging within said openings and having cam surfaces contacting the surfaces defining the ends of said openings.

6. A fastener driving device as defined in claim 5 wherein said spring-actuated member is provided with an abutment surface for engageably receiving the outer end of said spring pressed pawl and a cam surface extending forwardly from said abutment surface for engaging the lower portion of said pawl in response to the movement of said actuating lever toward said operative position so as to effect movement of said pawl out of engagement with said abutment surface when said actuating lever reaches said operative position.

7. A fastener driving device as defined in claim 6 wherein said spring-actuated member has its forward end pivotally connected with said first arm means of said bellcrank member.

8. A fastener driving device as defined in claim 7 wherein said bellcrank member is provided with an abutment surface on its periphery adjacent the pivotal connection of said spring-actuated member therewith for engageably receiving the outer end of said pawl and a cam surface extending forwardly from said abutment surface for engaging the lower portion of said pawl in response to the movement of said actuating lever toward said operative position so as to effect movement of said pawl out of engagement with said abutment surface when said actuating lever reaches said operative position.

9. A fastener driving device as defined in claim 6 wherein said housing includes a pair of complementary housing parts secured together in side-by-side relation, each of said housing parts having a hand opening formed in the central rearward portion thereof with the interior peripheral edge portions defining the opening turned inwardly and disposed adjacent the other, each of said housing parts also including upper and rearward edge portions turned inwardly and disposed adjacent the other, said elongated hollow handle portion being defined in part by certain of said inturned edge portions.

10. A fastener driving device as defined in claim 9 including a hollow tube disposed within said hollow handle portion in engagement with said certain inturned edge portions, said elongated coil spring being mounted within said tube.

11. A fastener driving device as defined in claim 9 wherein said elongated coil spring is mounted within said hollow handle portion with its outer periphery in guidingly confined engagement with said certain inturned edge portions.

12. A fastener driving device as defined in claim 1 wherein said housing includes a pair of complementary housing parts mounted in side-by-side relation, said housing parts including laterally spaced forward portions open at their forward ends between which said bellcrank member is pivotally mounted, said resilient bumper means includes a resilient bumper pad, means on said housing parts for supporting said bumper pad between the forward portions thereof in the path of movement of said bellcrank member, one of said housing parts including an opening in the forward portion thereof of a size to receive

said bumper pad therethrough for movement into operative relationship with said support means, said housing also including a nose cap secured over the forward portions of said housing parts in substantial closing relation to the open forward ends thereof and to said opening to prevent movement of said bumper pad out of operative relationship with said support means.

13. A fastener driving device as defined in claim 12 wherein the other of said housing parts is provided with an opening in alignment with said opening in said one housing part, the surfaces of said housing parts defining the lower portions of said openings constituting said support means with said bumper pad extending therebetween.

14. A fastener driving device as defined in claim 13 wherein said bellcrank member has a yoke fixedly secured thereto, said yoke having a bumper pad engaging surface of an area substantially coextensive with said bumper pad disposed below the second arm means of said bellcrank member.

15. A fastener driving device as defined in claim 14 wherein said bumper pad engaging surface is disposed at an acute angle to the horizontal when engaged with said bumper pad.

16. A fastener driving device as defined in claim 13 wherein said nose cap and said actuating lever are connected to said housing parts by a common pivot pin permitting said nose cap to be pivoted between an operative position and an access position.

17. A fastener driving device as defined in claim 1 wherein said fastener magazine means comprises a magazine assembly and means for removably mounting said magazine assembly on said housing including interengaging elements on the rearward portion of said magazine assembly and the lower rearward portion of said housing and a removable pin extending through the lower forward portion of said housing and the forward portion of said magazine assembly.

18. A fastener driving device as defined in claim 17 wherein said housing includes a pair of complementary housing parts secured together in side-by-side relation, said housing parts including laterally spaced forward portions open at their forward ends and a nose cap mounted over the forward portions of said housing parts in closing relation to the open forward ends thereof, the lower portion of said nose cap receiving said removable pin therethrough.

19. A fastener driving device as defined in claim 18 wherein said nose cap and said actuating lever are connected to said housing parts by a common pivot pin permitting said nose cap to be pivoted from its normal operative position into an access position when said removable pin is removed.

20. A fastener driving device as defined in claim 1 wherein said fastener magazine means comprises structure operatively fixed with respect to said housing, said fixed structure including means defining an elongated opening facing outwardly in the direction of outward extent of said drive track of a size to receive a fastener stick transversely therethrough, as by dropping the same in inverted condition while said opening is held in an upwardly facing position and means inwardly of said opening communicating at one end with said drive track for engaging a fastener stick received through said opening and supporting the same for longitudinal sliding movement toward said drive track, an elongated movable structure, said structures having cooperating means thereon for slidably supporting said movable structure for movement between a fastener stick loading position disposed longitudinally outwardly of said fixed structure wherein a fastener stick can be received through said opening and an operative position substantially coextensive with said fixed structure, said movable structure including elongated fastener stick engaging means for slidably supporting a fastener stick when said movable structure is disposed in said operative position, pusher means slidably supported on the fastener stick engaging means of said movable structure, spring means operatively connected between said pusher means and said movable structure for resiliently urging said pusher means toward a limiting position adjacent said drive track when said movable structure is disposed in said operative position so that when said movable structure is disposed in said loading position said pusher means is biased into its limiting position and upon movement of said movable structure inwardly toward said operative position said pusher means will first engage the trailing end of a fastener stick received through said opening and upon further inward movement of said movable structure said spring means will be stressed biasing said pusher means and the leading end of the fastener stick engaged thereby toward said drive track and said movable structure outwardly toward said loading position, and locking means for releasably locking said movable structure in said operative position, said locking means including a generally cylindrical locking pin, said movable structure having generally vertically extending slot means formed in the outer end portion thereof receiving said locking pin for movement therein between locking and releasing positions, spring means operatively connected between said locking pin and said movable structure for resiliently biasing said locking pin toward said locking position, said fixed structure providing first locking pin engaging surface means for engaging said locking pin and moving the same against the action of its spring means toward its release position in response to the movement of said movable structure toward and adjacent its operative position and second surface means engageable by said locking pin in response to spring biased movement of the latter toward said locking pin when said movable structure is moved into said operative position operable to positively prevent movement of said movable structure outwardly of said operative position in response to the application of longitudinally outward forces thereon except following manual movement of said locking pin into said releasing position.

21. In a fastener driving device comprising a housing having means defining a drive track, fastener driving means mounted in said housing for movement through said drive track in a drive stroke and a return stroke, and fastener magazine means carried by said housing for retaining an elongated stick of fasteners and for feeding a leading fastener from said stick to said drive track to be driven by said fastener driving means during the drive stroke thereof, in which such magazine means includes structure operatively fixed with respect to said housing, said fixed structure including means defining an elongated opening facing outwardly in the direction of outward extent of said drive track of a size to receive a fastener stick transversely therethrough, as by dropping the same in inverted condition while said opening is held in an upwardly facing position and means inwardly of said opening communicating at one end with said drive track for engaging a fastener stick received through said opening and supporting the same for longitudinal sliding movement toward said drive track, an elongated movable structure, said structures having cooperating means thereon for slidably supporting said movable structure for movement between a fastener stick loading position disposed longitudinally outwardly of said fixed structure wherein a fastener stick can be received through said opening and an operative position substantially coextensive with said fixed structure, said movable structure including elongated fastener stick engaging means for slidably supporting a fastener stick when said movable structure is disposed in said operative position, pusher means slidably supported on the fastener stick engaging means of said movable structure, spring means operatively connected between said pusher means and said movable structure for resiliently urging said pusher means toward a limiting position adjacent said drive track when said movable structure is disposed in said operative position so that when said movable structure is disposed in said loading position said pusher means is biased into its limiting position and upon movement of said movable structure inwardly toward said operative position said pusher means will first engage the trailing end of a fastener stick received through said opening and upon further inward movement of said movable structure said spring means will be stressed biasing said pusher means and the leading end of the fastener stick engaged thereby toward said drive track and said movable structure outwardly toward

said loading position, and locking means for releasably locking said movable structure in said operative position, the improvement which comprises said locking means including a generally cylindrical locking pin, said movable structure having generally vertically extending slot means formed in the outer end portion thereof receiving said locking pin for movement therein between locking and releasing positions, spring means operatively connected between said locking pin and said movable structure for resiliently biasing said locking pin toward said locking position, said fixed structure providing first locking pin engaging surface means for engaging said locking pin and moving the same against the action of its spring means toward its release position in response to the movement of said movable structure toward and adjacent its operative position and second surface means engageable by said locking pin in response to spring biased movement of the latter toward said locking position when said movable structure is moved into said operative position operable to positively prevent movement of said movable structure outwardly of said operative position in response to the application of longitudinally outward forces thereon except following manual movement of said locking pin into said releasing position, said slot means including means defining third and fourth surface means guidingly mounting said locking pin for movement between said locking and releasing positions, said second and fourth surface means extending at different angles defining approximately 5° therebetween and neither of which is less than 82½° measured with respect to the direction of movement of said movable structure.

22. The improvement as defined in claim **21** wherein said locking pin spring means is of a strength sufficient to effect movement of said movable structure into said operative position against the bias of said pusher means spring means when said locking pin is disposed in engagement with said second surface means and said movable structure has not fully reached said operative position.

23. The improvement as defined in claim **22** wherein said movable structure includes means defining third and fourth surface means guidingly mounting said locking pin for transverse movement between said locking and releasing positions, said second and fourth surface means extending at different angles defining approximately 5° therebetween and neither of which is less than 82½° measured with respect to the direction of movement of said movable structure.

24. The improvement as defined in claim **21** wherein said first and third surface means extend at different angles defining approximately 45° therebetween.

25. The improvement as defined in claim **21** wherein said movable structure includes an abutment adjacent the drive track end thereof, said pusher means including a portion engageable by said abutment, the position of said abutment engaging portion being related to the position of the connection of said spring means with said pusher means to bias the trailing end of said pusher means in a transverse direction about said abutment as a fulcrum when in engagement therewith, said fixed structure including a surface permitting said biased lateral movement of said pusher means in response to the movement of said movable structure into said loading position and abutment means for engaging the trailing end of said pusher means to thereby limit the outward movement of said movable structure beyond said loading position.

26. The improvement as defined in claim **25** wherein said fixed structure includes an access opening permitting manual lateral movement of said pusher means against the bias thereof out of engagement with the abutment on said fixed structure to release said movable structure for outward separating movement beyond said loading position.