# United States Patent [19]

**Howard**

[11] **3,840,165**

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[54] **MAGAZINE RELEASE MECHANISM FOR FASTENER DRIVING TOOL**


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[52] **U.S. Cl.** ..... **227/1,** 227/122, 227/123

[51] **Int. Cl.** ..... **B25c 5/16**

[58] **Field of Search** ..... 227/1, 122, 123, 127, 128, 227/156



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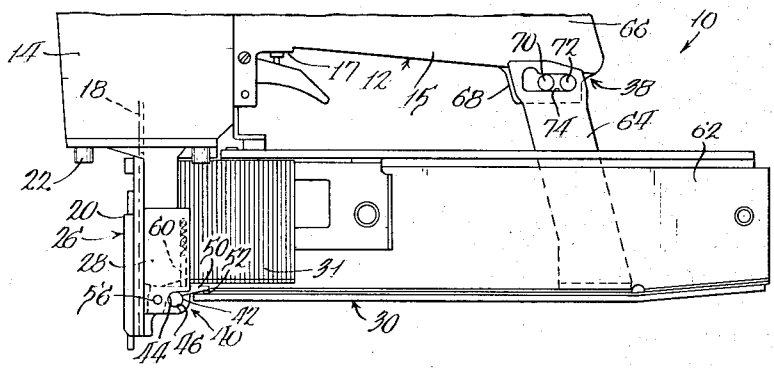
*Attorney, Agent, or Firm*—Dressler, Goldsmith, Clement & Gordon, Ltd.



[57] **ABSTRACT**

A magazine for a fastener driving tool automatically opening in the event of jamming to provide ready access to the deformed fastener. The fastener magazine is movably secured relative to a driver assembly by a cammed hinge, and a resiliently biased releasable latch located between the magazine and nose assembly maintaining the magazine in a fastener feeding position. The latch releases in response to jamming of a deformed fastener and the expansive forces generated thereby, whereupon the cammed hinge permits the magazine to move under the influence of such forces to a release position spaced from the nose assembly to allow access to the deformed fastener.


**13 Claims, 6 Drawing Figures**



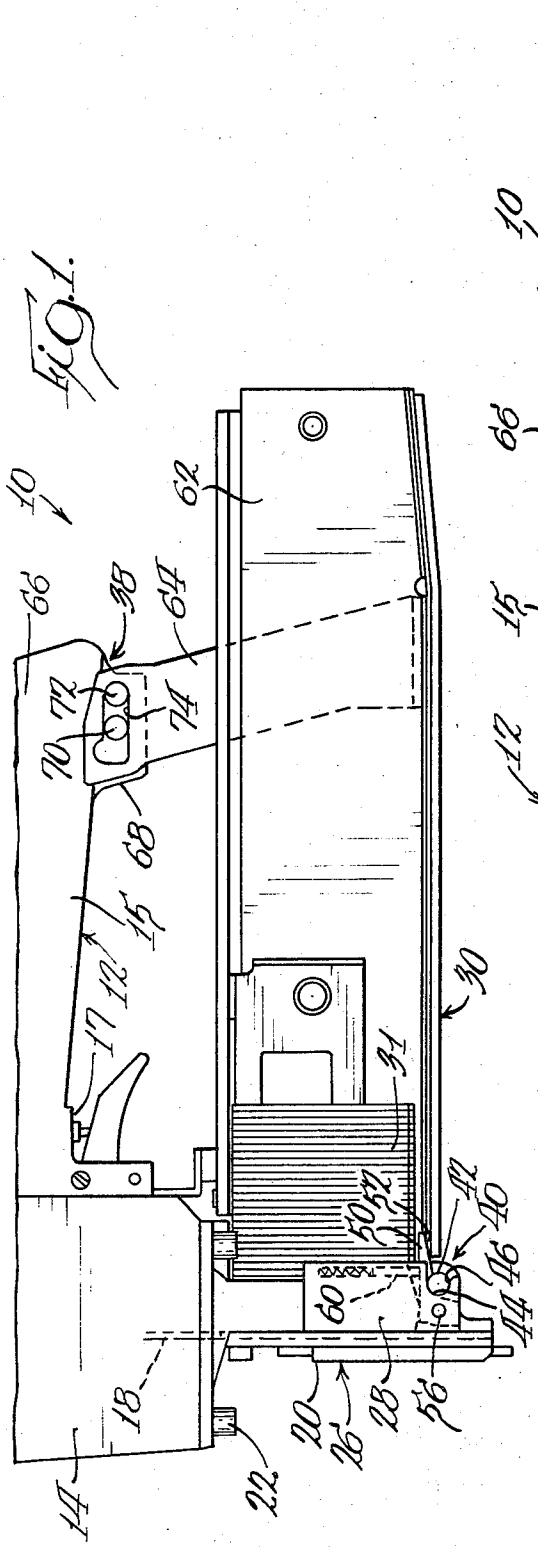

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FIG. 1.

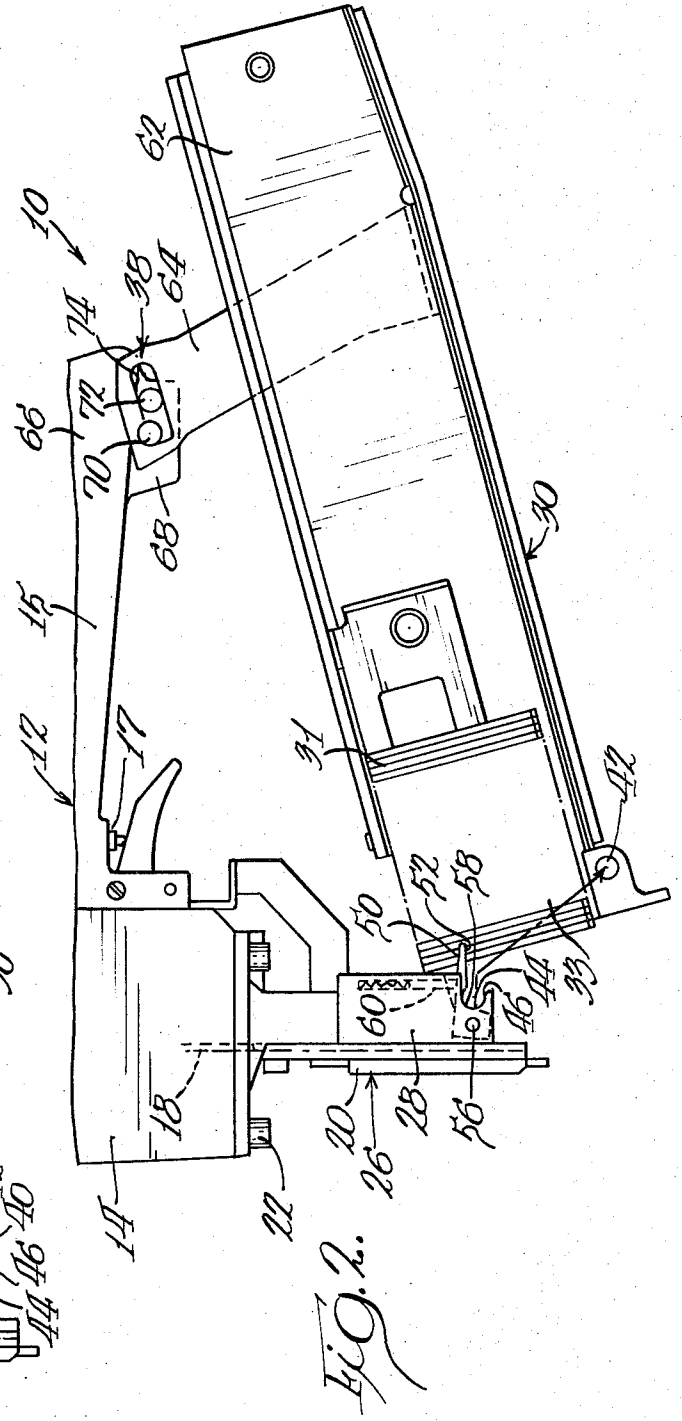
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FIG. 2.

Fig. 3.

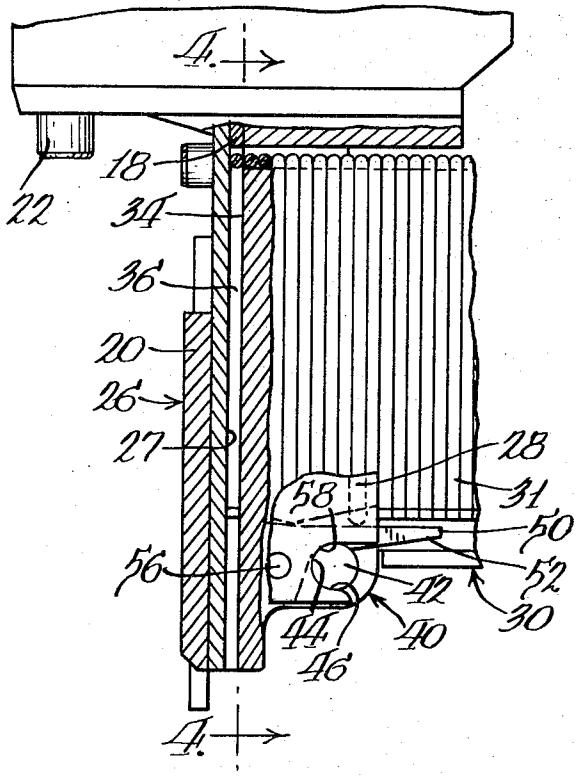



Fig. 4.

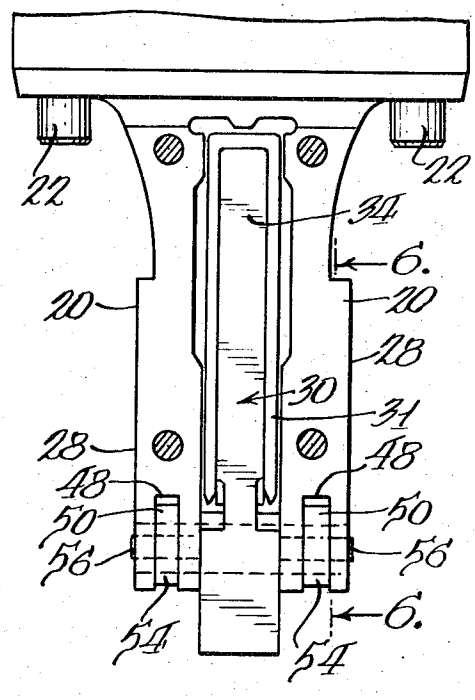



Fig. 5.

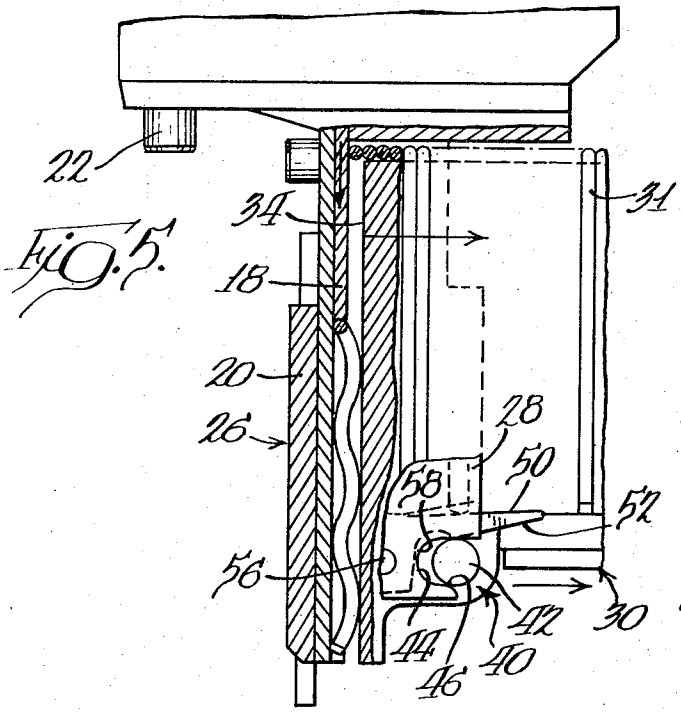
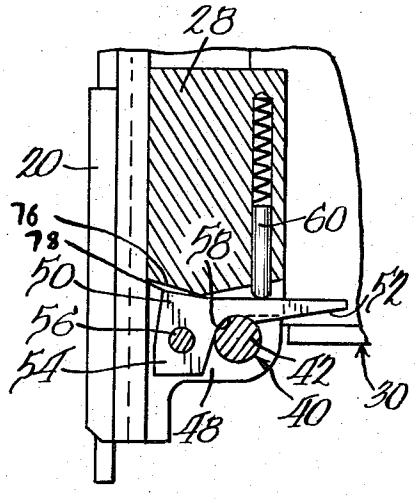



Fig. 6.



# MAGAZINE RELEASE MECHANISM FOR FASTENER DRIVING TOOL

## BACKGROUND OF THE INVENTION

The invention relates to fastener driving tools, and particularly to an improved arrangement for automatically opening the magazine in the event that a fastener becomes deformed and jams therewith, so that easy removal of the deformed fastener is made possible.

A persistent problem with all fastener driving tools is the inevitable, occasional deformation and consequent jamming of a fastener within the tool, particularly within the guideway from which a fastener is normally driven from the tool. The possible causes of such jamming are well-known and numerous; for example, a hard spot in the work piece, or defective fasteners; but the consequent jamming and work interruption is the same, regardless of cause. Particularly in the case of larger power-driven tools, where considerable forces are generated, undue deforming stresses on components of the tool also result from such jams.

Formerly, it was necessary to do much inconvenient and time-consuming disassembly of the tool in order to gain access to the deformed fastener and to remove it. More recently, various arrangements have been devised to facilitate such access. Exemplary of such arrangements have been closure members forward of the fastener driving guideway and typically on opposite sides thereof from the magazine which stores and feeds the fasteners. Such closure members are disengageable from the tool to expose the guideway for allowing withdrawal of the deformed fastener. Since many of these closure members have proved difficult to open in practice when jamming occurs, some have been constructed so as to respond to the occurance of a jam by disengaging from the remainder of the tool without manipulation by the user of the tool.

However, none of these expedients has proved fully successful. Extraneous tools have been needed to restore prior art closures to their operational mode. Further, many have employed complex, wear-prone mechanisms, or numerous small parts, which have rendered difficult the maintenance of proper fastener guideway tolerances, as well as of consistent operation to release only with the proper predetermined degree of internal stress. This has led to the further disadvantages of an increase in the frequency of false releases with wear, and further interruption of normal operation.

## SUMMARY OF THE INVENTION

The present invention provides a fastener driving tool in which the magazine opens automatically in response to the deformation of a fastener in the guideway to provide unimpeded access to the deformed fastener for its removal. The tool features a novel magazine-release operation of improved simplicity and reliability, requires no extraneous tools, and is very quickly restorable to its operational mode.

The novel tool disclosed herein comprises a housing containing a body portion with a nose assembly, and a magazine assembly for successively feeding fasteners to be driven by the tool. Means are provided for securing the magazine assembly to the housing to allow movement of the magazine between a fastener feeding position closely adjacent the nose assembly, and a release position spaced therefrom.



Also provided are latch means for releasably maintaining the magazine assembly relative to the housing in the fastener feeding position during the normal operation of the tool. However, when a fastener is deformed instead of being driven cleanly by the driver assembly, the latch means responds to the forces exerted by the deformed fastener to release the magazine assembly. Under the influence of such forces, the magazine assembly thereupon moves from the feeding position to the release position.

In this manner, the deformed fastener is exposed and may be readily dislodged from the tool, whereupon the magazine assembly may be immediately returned to its fastener feeding position, and normal operation resumed. The action of the tool is automatic and accomplished by an uncomplicated arrangement of inherently superior reliability and greatly simplified operation, particularly as compared to prior expedients.

## BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

FIG. **1** is a partial side elevational view showing a fastener driving tool in its operational mode, with the magazine in the fastener feeding position;

FIG. **2** is a partial side elevational view of the fastener driving tool of FIG. **1** showing the magazine assembly in the release position;

FIG. **3** is a side elevational view in cross section of a detail of the tool of FIGS. **1** and **2**, showing the normal driving of a fastener;

FIG. **4** is a front elevational view partially in cross section of the tool of FIGS. **1** and **3**, taken along line **4—4** of FIG. **3**;

FIG. **5** is a view similar to FIG. **3**, showing the occurrence of a jam and the initiation of the movement of the magazine to the release position; and

FIG. **6** is a fragmentary cross-sectional view taken along line **6—6** of FIG. **4** of a detail of tool of FIGS. **1–5.**

## DETAILED DESCRIPTION

While this invention is susceptible of embodiment in many different forms, there is shown in the drawings and will herein be described in detail a preferred embodiment of the invention with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the embodiment illustrated. The scope of the invention will be pointed out in the appended claims.

FIG. **1** illustrates a fastener driving tool **10** having a unitary housing **12**, including a generally cylindrical upright portion **14**, and a transverse handle-like graspable portion **15.** Cylindrical portion **14** encloses a fastener driving mechanism controlled by trigger valve means **17** in accordance with any of the numer of well-known arrangements. In any case, the driving mechanism, of which drive member **18** is a part, reciprocates member **18** vertically below cylinder portion **14.** The driving mechanism may involve a piston (not shown) to which driver **18** is secured, and which is pneumatically reciprocated, as described in U.S. Pat. No. 3,106,136 to A. Langas, entitled "Fastener Driving Tool."

Also included in housing **12** is a downwardly-extending nose piece **20** secured to the lower end of cylindrical portion **14** by bolts **22.** The driving mechanism with member **18** is part of a typical fastener driver as-

sembly. The term "fastener driving assembly" encompasses many forms and is clearly not limited to the one illustrated.

Nose piece **20**, which is part of fastener nose assembly **26**, includes a rearwardly facing vertical surface defining a shallow fastener guideway channel **27** coaxially aligned with driver **18**, and illustrated in cross section in FIG. **3**. Channel **27** opens rearwardly outwardly and extends vertically from cylindrical portion **14** to the bottom of nose piece **20**. The channel matches in thickness and cross-sectional shape the type of fasteners which are to be driven by the tool, as well as the driver member **18**, to permit movement of the driver therealong. Also included in nose piece **20** is a pair of spaced side members **28** extending rearwardly outwardly on either side of channel **27**, and vertically upwardly to cylindrical portion **14**. Members **28** are provided with recesses within which are mounted components of a latch arrangement to be described below.

The tool also includes an elongated fastener magazine assembly **30** releasably held by means to be described in a position generally along and below graspable portion **15** and closely adjacent nose assembly **26**, during normal operation; see FIG. **1**. The magazine assembly is conventional and may be adapted for use with staples as illustrated, or it may be adapted for use with other fasteners, such as nails, or the like. The magazine assembly holds fasteners **31** arrayed for feeding serially toward its leading end **33**, and then under driver **18**. End **33** terminates in a flat leading face **34**, perpendicular to the longitudinal axis of the magazine, and adjacent nose assembly **26**.

Accordingly, when in the just-described attitude, the magazine assembly is in a fastener feeding position, with nose side members **28** closely embracing a portion of magazine leading end **33**. At the same time, magazine leading face **34** is parallel to and in opposed abutting relationship to guideway channel **27**. Face **34** thus closes the open side of channel **27** to define fastener guide passageway **36** along which fasteners **31** are driven. The manner in which such cooperation defines passageway **36**, and its coaxial relationship with driver **18**, is best shown in FIG. **3**.

Passageway **36** could also be defined in another manner, for example, by including a guideway channel on magazine face **34**, with or without a corresponding channel on the facing surface of nose piece **20**. FIG. **3** best shows the manner in which the fasteners emerge from the magazine into guide passageway **36**. The driving operation is conventional, with driver **18** descending upon each fastener as it is positioned in the passageway to drive it into the work piece.

In accordance with the invention, magazine assembly **30** is supported relative to housing **12** and nose assembly **26** so as to automatically move from the fastener feeding position (FIG. **1**) closely adjacent nose assembly **26** to a release position (FIG. **2**) spaced from nose assembly **26**, under the influence of the large expansive forces exerted by a jammed fastener within passageway **36**. In general, magazine assembly **30** is movably secured to housing **12**, preferably at a point adjacent its trailing end **62**, by an arrangement shown generally at **38** permitting limited rearward movement of the magazine assembly with respect to housing **12** and nose assembly **26**. The details and operation of arrangement **38** will be described in more detail below. Magazine assembly **30** is further secured to housing **12**, preferably between leading end **33** thereof and nose assembly **26**, by a latch arrangement **40**, which releases when the expansive forces due to a jam exceed a predetermined level. The magazine assembly thereupon is permitted by arrangement **38** to move away from nose assembly **26** under the influence of the expansive forces to expose the deformed fastener.

Latch arrangement **40**, the details of which are shown in FIGS. **3–6**, includes a pair of identical cylindrical latch pins **42** adjacent the lowermost corner of magazine leading end **33**. Latch pins **42** extend transversely outwardly from either side of magazine **30**, perpendicularly to the longitudinal axis of the magazine. Matching pins **42** are a pair of relatively shallow concave recesses **44**, each in the lower rear corner of one of side members **28**. Each of the recesses runs the width of respective side members **28**, opening rearwardly and including an upwardly facing lower surface portion **46**. The recesses match pins **42** and accept them to aid in supporting magazine leading end **33** when the magazine is in the feeding position.

Nose side members **28** further include relatively narrow slots **48** in the lowermost end of each member **28** and intersecting recesses **44**. Each of slots **48** extends downwardly and rearwardly in its member **28**, as well as opening downwardly and rearwardly; see FIGS. **4** and **6** particularly. Each slot is located generally midway of each side member **28**, and within each slot is a generally L-shaped main locking member **50** of latch arrangement **40**. Member **50** has an elongated rearwardly extending leg **52**, and a relatively thick downwardly extending support leg **54**.

Each locking member **50** is pivotally mounted by means of pin **56** passing transversely through leg **54** and the associated side member **28**. Each elongated leg **52** extends outwardly from its associated side member generally along the upper surface of one of the recesses **44**. The lower surface of each leg **52** is curved to include a concave portion **58** matching a portion of the cylindrical surface of pins **42**, and complementing the upwardly facing surface **46** of recesses **44**.

To complete latch arrangement **40**, a pair of spring-loaded plungers **60** mounted within each side member **28** acts on elongated legs **52** downwardly at a point rearward of concave portion **58** to bias locking member **50** downwardly. Thus, when magazine **30** is in its fastener feeding position (see FIGS. **3** and **6**), pins **42** rest within concave recesses **44**, as above described, aided in the vertical support of the magazine assembly by arrangement **38**. Also, pins **42** are releasably locked in this attitude by the downwardly biased legs **52** of locking members **50**, with concave portions **58** engaging the matching cylindrical surfaces of pins **42**. In this manner, the greater portion of the circumferences of pins **42** is encircled and closely engaged cooperatively by recesses **44** and locking member **50**. Thus, latch arrangement **40** retains magazine assembly **30** against rearward movement to maintain passageway **36** within fixed dimensional tolerances, during normal operation.

With the occurrence of a jam as one of fasteners **31** is being driven, a strong expansive force is created in guide passageway **36** as the driving force exerted by driver **18** distorts the fastener (see especially FIG. **5**). This force bears against magazine leading face **34**, and thus tends to move the magazine together with pins **42** rearwardly. Once the magnitude of the force exceeds

that exerted by the bias of plungers **60**, pins **42** with magazine **30** move rearwardly to overcome the latch arrangement by forcing legs **52** upwardly into the position shown in FIG. **5**. In this manner access is provided to the deformed fastener to permit its quick and easy removal.

Returning to a more detailed consideration of arrangement **38**, magazine trailing end **62** is supported upon housing portion **15** by a magazine support bracket **64** secured at end **62**. The bracket extends upwardly from magazine **30** and is angled slightly toward leading end **33** thereof; see FIGS. **1** and **2**. Joining bracket **64** at the upper end thereof to trailing end **66** of portion **15** opposite nose assembly **26**, and spaced therefrom, is arrangement **38**, which comprises a cammed hinge.

This arrangement **38** includes a relatively narrow boss portion **68** on graspable portion **15** which extends downwardly therefrom at end **66**. Also included are a pair of identical slightly spaced-apart cylindrical guide pins **70** and **72**, both extending horizontally outwardly from boss **68** and perpendicular to the horizontally outwardly from boss **68** and perpendicular to the longitudinal axis of portion **15**. Both pins lie in a horizontal line extending generally in the same sense as graspable portion **15**, and perpendicular to guide channel **27**.

The final element of hinge **38** is a slot **74** provided in the upper end of bracket **64** and elongated longitudinally in the general direction of the magazine axis. The slot length is somewhat less than twice the spacing between the axis of guide pins **70** and **72**, and its width matches that of the pins except at the leading end thereof, where the slot is upwardly relieved or enlarged to add an additional small fraction of the pin diameter.

Cammed hinge arrangement **38** secures bracket **64** with the remainder of the magazine assembly to housing portion **15** by means of guide pins **70** and **72** engaged within slot **74**. The pins ride within the slot to provide a cammed pivot operation. In the fastener feeding position of FIG. **1**, bracket **64** is positioned with respect to boss **68** so that pins **70** and **72** are rearmost in slot **74**. In this attitude the pins support the magazine assembly longitudinally in line with the driver assembly and perpendicular to passageway **36**. In the release position of FIG. **2**, the magazine assembly is spaced from driver assembly **26**, having moved rearwardly and downwardly relative thereto. In achieving this release position, the magazine assembly and its leading end **33** must first move rearwardly a small distance, whereupon the enlarged leading end of slot **74** is brought into alignment with leading guide pin **70**. In such position, the bracket **64** together with the remainder of the magazine assembly is free to pivot downwardly about trailing pin **72**, stopping when pin **70** contacts the uppermost portion of the enlarged end of slot **74**.

The spatial relationships between pins **70** and **72** and slot **74**, particularly the height of the enlarged slot end, are controlled so that such downward pivoting is limited to a predetermined distance, to prevent spillage of fasteners **31** arrayed upon the magazine. Thus, in the release position, the top edge of magazine **30** is held slightly above and closely adjacent the lower portion of nose piece **20**, with the top corner of end face **34** abutting such lower nose piece portion. The curvature of the coacting surfaces on guide pins **70** and **72**, and slot **74**, permits the magazine assembly to be smoothly moved from the fastener feeding position to the release position, and vice versa.

The longitudinal position of pins **42** and the remainder of latching arrangement **40** is carefully related to that of cammed hinge arrangement **38** to insure that when locking members **50** and pins **42** are in engagement, guide pins **70** and **72** are positioned rearwardly of the relieved portion of slot **74**. Similarly, this relationship insures hat when locking members **50** and pins **42** are disengaged and magazine assembly has moved rearwardly from nose piece **20**, leading pin **70** is in association with the relieved slot portion. Thus, with the occurrence of a jam as above described, the rearward movement brings the enlarged portion of slot **74** of hinge arrangement **38** toward leading guide pin **70** while pins **42** leave recesses **44** and nose piece **20**. The entire magazine then pivots downwardly and rearwardly to the release position, as described above. This movement, of course, opens passageway **36**, separating end face **34** from guide channel **27**, so that each is substantially transversely clear of the other. Thus, the channel, face **34**, and the deformed fastener resulting from the jam are exposed, permitting the operator to dislodge the fastener very readily, if it has not already fallen away from the opening of the passageway.

Arrangements other than that described above for the cammed hinge may be utilized for supporting magazine assembly **30** below housing portion **15**, as long as rearward movement of the magazine assembly is allowed, and the leading end thereof is maintained adjacent nose assembly **26**. For example, a slot and pin arrangement which permitted only rearward movement of the magazine might be used. However, the preferred cammed hinge **38** provides superior advantages because of its positive pivoting operation and because both magazine and face **34**, and guide channel **27** are fully exposed to provide substantially unimpeded access to a deformed fastener. Also, the downwardly pivoted position prevents spillage of fasteners, as has been described.

Similarly, the configuration and position of the latch arrangement may differ from that described above, as long as the variant arrangement maintains magazine assembly **30** against separation from nose assembly **26** under all but the abnormal forces occasioned by a jam. However, the preferred latch arrangement **52** requires a minimum of parts, all of which are inherently rugged, and moreover is highly resistant to wear. Further, latch arrangement **40** permits the proper cooperation with cammed hinge **38** to obtain the above-described downwardly pivoting action of the magazine.

With the deformed fastener removed, restoration of the magazine assembly to its feeding position is immediately accomplished. Magazine leading end **33** is merely raised toward graspable portion **15** until pins **60** contact legs **52** of locking members **50**, then the magazine is moved forward into recesses **44** until concave surface portions **58** of legs **52** fully enbrace pins **56**. At the same time, guide pins **70** and **72** of cammed hinge **38** are positioned rearwardly in slot **74** to support the magazine in its feeding position.

Locking member **50** and recesses **48** include respective opposed closely adjacent surfaces, each of which is slightly inclined with respect to its facing opposite member when in the feeding position, to control the pivoting excursions of member **50** (see FIG. **6**). The surfaces include transverse surfaces **76** and **78**, respec-

tively, defined by recesses **48** and legs **52** above pivot pins **56,** and in this manner, each leg **52** is allowed to pivot downwardly to a small degree (FIG. **2**) and to be held in that orientation when magazine **30** is in its release position. Such an orientation enables each leg **54** to contact and guide pins **42** as they are moved back into latching engagement, to insure a smooth and rapid restoration of the magazine to the feeding position, and thus to normal operation.

Accordingly, a unique fastener driving tool has been disclosed which in the event a fastener jams during the driving thereof automatically responds to move the magazine assembly away from the nose assembly to a position downwardly and rearwardly of the nose assembly. The tool represents a considerable advance over prior art attempts to cope with the jamming problem. The disclosed automatic action of the magazine, in conjunction with the latch and cammed hinge arrangements, is unique and provides for heretofore unobtainable degree of access to the jam-prone portions of the tool, as well as unusual speed of operation, and user convenience. Nevertheless, the design is simple and straightforward, requires few parts and is inherently reliable.

What is claimed is:

**1.** A fastener driving tool including a housing containing a nose assembly, and a magazine assembly for successively feeding fasteners to be driven by said tool; means for securing said magazine assembly relative to said housing to allow movement of said magazine between a fastener feeding position closely adjacent said nose assembly, and a release position spaced therefrom; and latch means for releasably maintaining said magazine relative to said housing in said fastener feeding position, and positioned to respond to the forces exerted by a deformed fastener during the driving thereof to release said magazine whereby said magazine moves to said release position to permit said deformed fastener to be dislodged from said tool.

**2.** A fastener driving tool as in claim **1,** wherein said latch means is positioned upon said nose assembly and an adjacent portion of said magazine assembly, and includes a releasable locking member joining said nose assembly and said magazine.

**3.** A fastener driving tool as in claim **2,** wherein said means for securing said magazine includes a cam arrangement permitting rearward movement of said magazine relative to said nose assembly, and said releasable locking member is positioned on said nose assembly and engages said magazine to secure said magazine against said rearward movement.

**4.** A fastener driving tool as in claim **3,** in which said latch means further includes a latch member cooperating with said locking member, said members being associated with a respective one of said nose assembly and magazine, said locking and latch members having respective coacting cam surfaces, with said cam surfaces engaging and joining said nose assembly and magazine in the fastener driving position.

**5.** A fastener driving tool as in claim **4,** wherein said latch means further includes means for biasing said locking member to hold said coacting cam surfaces resiliently in engagement until overcome by the force caused by said deformed fastener.

**6.** A fastener driving tool as in claim **5,** wherein said latch member is secured to said magazine assembly, and said locking member is pivotally mounted on said nose assembly and has an elongated leg extending rearwardly and outwardly of said nose assembly, to engage said latch member.

**7.** A fastener driving tool as in claim **6,** in which one surface of said leg defines a curved surface portion constituting one of said coacting cam surfaces, and said latch member comprises a cylindrical pin extending transversely to said leg and outwardly of said magazine, the cylindrical surface of said pin constituting the other of said coacting cam surfaces and matching said curved surface of said leg, said leg resiliently engaging said pin to maintain said magazine in said feeding position.

**8.** A fastener driving tool as in claim **1,** wherein said means for movably securing said magazine assembly includes hinge means pivotally joining said magazine to said housing.

**9.** A fastener driving tool as in claim **8,** in which said magazine assembly defines a leading end adjacent said driver assembly, and a trailing end opposite therefrom, with said leading end being in opposed relationship to said nose assembly in said fastener feeding position to define a fastener driving passageway, said magazine extending beneath the remainder of said housing and said hinge means being positioned adjacent said trailing end.

**10.** A fastener driving tool as in claim **1,** wherein said means for movably securing said magazine includes a longitudinally elongated slot provided on said magazine assembly, with the leading end of said slot being upwardly enlarged, and at least one guide pin mounted on said housing and extending transversely outwardly therefrom, said guide pin engaging said slot to secure said magazine assembly to said housing, while permitting movement of said magazine assembly toward and away from said nose assembly, said pin moving into said enlarged slot portion as said latch means releases and said magazine assembly moves rearwardly, thereby to pivot said magazine assembly downwardly away from said nose assembly.

**11.** A fastener driving tool as in claim **10,** in which said upward enlargement is of a height such that the top edge of the magazine in the release position is held slightly above and closely adjacent the lower portion of the nose assembly, to prevent fasteners stored in said magazine from emerging when said magazine is in said release position.

**12.** A fastener driving tool as in claim **10,** wherein said means for movably securing said magazine includes two identical spaced guide pins, the length of said slot being greater than the spacing between said pins, said pins supporting said magazine assembly in said feeding position when said pins are positioned rearmost in said slot, and said magazine assembly being free to pivot downwardly about the rearmost pin a predetermined distance as the leading end of said pins moves into said enlarged slot portion.

**13.** A fastener driving tool, comprising: an elongated magazine assembly successively feeding fasteners to be driven by said tool, said magazine having a leading end terminating in a transverse leading end face, said face being perpendicular to the longitudinal axes of the magazine; a housing containing a nose assembly having a downwardly extending nose piece, said nose piece having a rearwardly facing surface which when in abutting relationship with said magazine end face defines with said face a downwardly extending fastener driving passageway; means located in spaced relationship from

said magazine leading end and said nose assembly for movably securing said magazine assembly to said housing to allow movement of said magazine assembly between a fastener feeding position, in which said magazine leading end face abuts said nose assembly surface to define said passageway, and a release position in which said magazine leading end is spaced from said nose assembly; and latch means for releasably maintaining said magazine assembly in said fastener feeding position, including first and second cooperating latch members respectively associated with said nose assembly and said magazine, each of said members having coacting cam surfaces, said latch means further including resilient means biasing said cam surfaces into engagement when said magazine is in said feeding position, said biasing being overcome by the expansive forces generated within said passageway by a deformed fastener during the driving thereof to release said magazine assembly, whereby said magazine assembly moves rearwardly to said release position to permit said deformed fastener to be dislodged from said tool.

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