# United States Patent

**Fernstrom**

[15] **3,698,599**

[45] **Oct. 17, 1972**


[54] **FEED TO DRIVING TOOL HAVING BAND HELD SCREWS**


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[22] Filed: **Feb. 19, 1971**

[21] Appl. No.: **116,852**

**Related U.S. Application Data**

[62] Division of Ser. No. 838,515, July 2, 1969, Pat. No. 3,601,168.

[52] **U.S. Cl.**.....**221/25,** 221/74

[51] **Int. Cl.**.....**B65h 5/28**

[58] **Field of Search**.....221/25, 70, 71, 72, 73, 74, 221/238; 227/136, 137; 144/32



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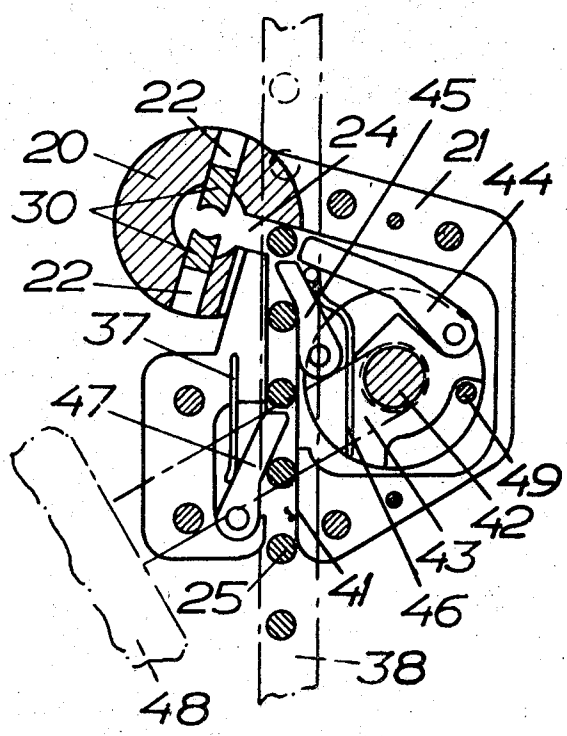
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[57] **ABSTRACT**

In a driving tool for fasteners a driver has guide jaws releasably clamped thereagainst for holding a fastener in frontal alignment therewith. During driving movement of the driver together with said fastener towards a work piece, the guide jaws, in response to said fastener striking against the work piece, are arrested in spaced relation to the work piece and knocked loose from the driver for releasing the fastener from the guide jaws while the driver continues its driving movement. The driving tool may be provided with a magazine for band supported fasteners, which by an ejector are forced to break out laterally one by one from the band in between the guide jaws and by a feeder are moved together with the band one after the other to the ejector, said ejector and feeder being pivotally supported on a rocker member such as to alternately actuate the fasteners as the arm is rocked alternately in one direction and the other.


**5 Claims, 9 Drawing Figures**



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SHEET 1 OF 2

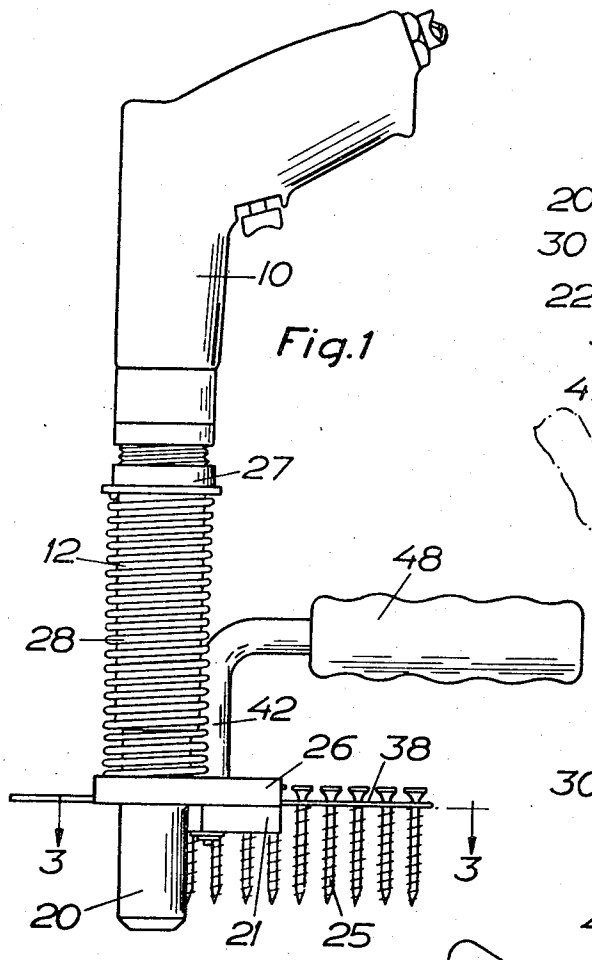



Fig.1

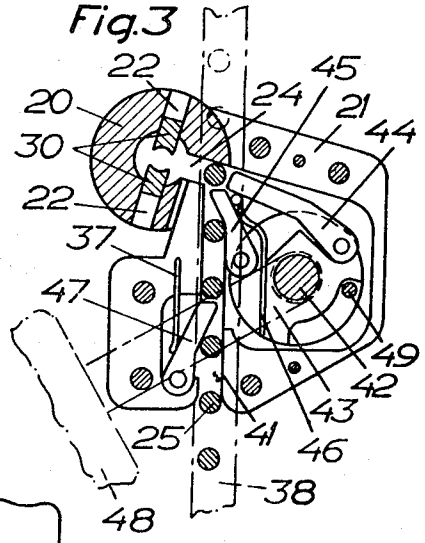



Fig.3

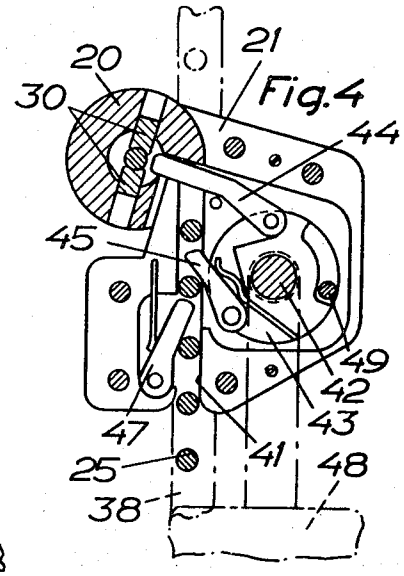



Fig.4

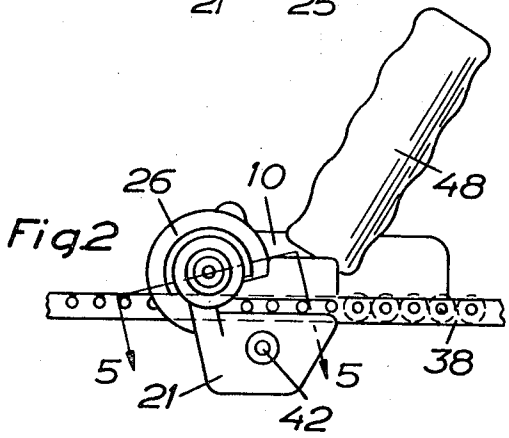
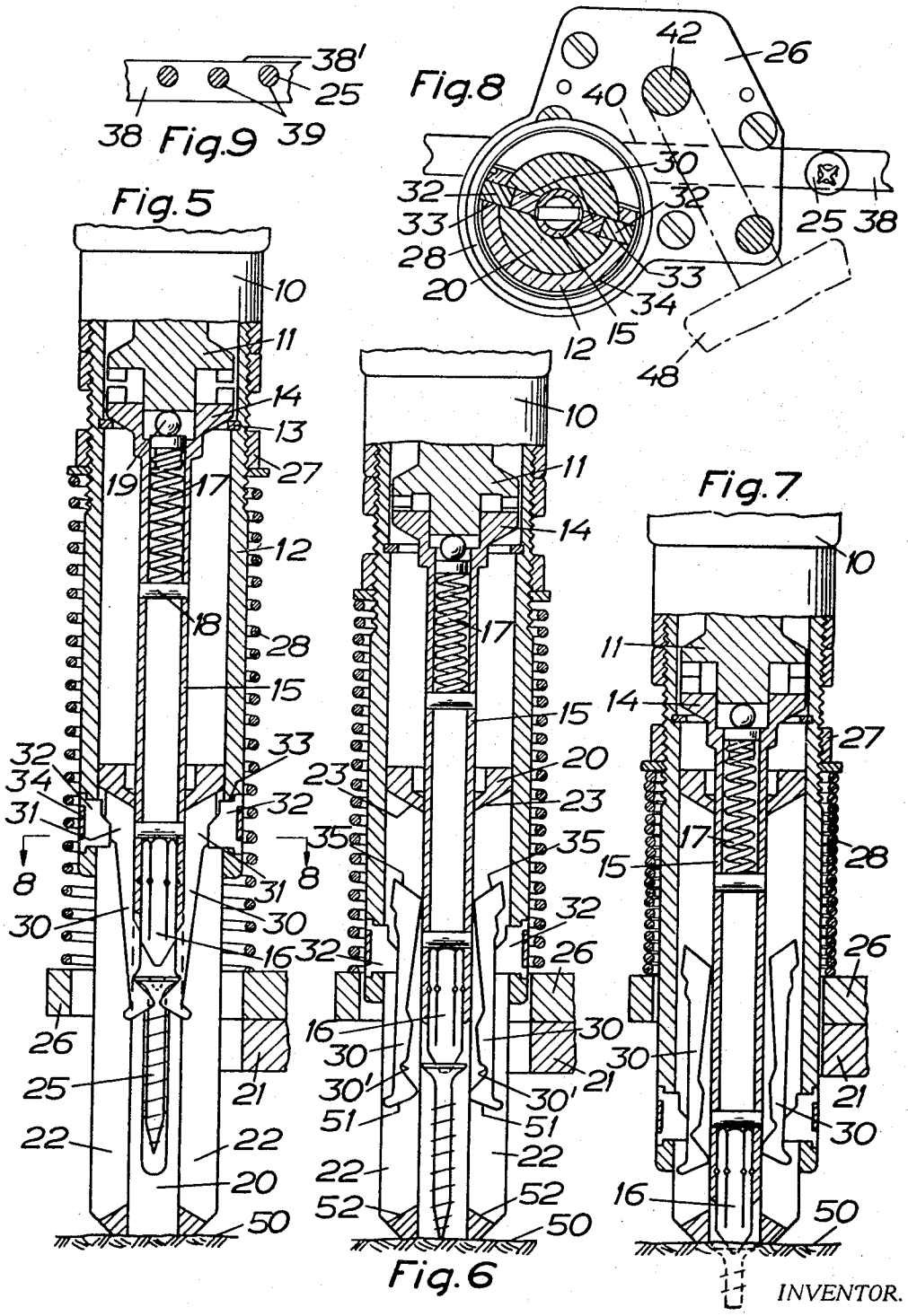



Fig.2

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# FEED TO DRIVING TOOL HAVING BAND HELD SCREWS

This is a division of application Ser. No. 838,515 filed July 2, 1969 now U.S. Pat. No. 3,601,168.

This invention relates to a driving tool for fasteners and particularly to a driving tool for fasteners in which a driver is carried axially movably between retracted and extended positions in a guide body on which is provided a feed opening for feeding fasteners one after the other into frontal alignment with the driver in the retracted position thereof, guide jaws being axially movably arranged relative to the driver between projected conjunct position in which the guide jaws are arranged to grip and hold a fastener in front of the driver and a retracted separated position for releasing the fastener.

In such driving tools the guide jaws in a number of design solutions hitherto have been released by striking against cam or abutment surfaces on the guide body, the abutment surfaces being axially adjustable to selective predetermined fixed positions thereon relative to the driving tool. Since the distance between the abutment surfaces and the work pieces into which the fasteners are to be driven often may be subjected to considerable variation, there occurs, because of the fixed position of said abutment surfaces, the risk of canted impacting or loss of the fastener when the latter is released too early. In other solutions the jaws hit the work piece for release thereby often causing undesirable denting or marring of the work surface. It is followingly the object of the invention to improve the advancement of the fastener to the work piece by making the release of the guide jaws directly dependent on the position of the work piece and to perform the release with the guide jaws safely spaced from the work piece.

For these and other purposes there is according to one aspect of the invention provided a driving tool for fasteners comprising a guide body, a driver axially movably carried in said guide body between retracted and extended positions relative thereto, a feed opening on said guide body, means for feeding fasteners one after the other through said feed opening into frontal alignment with said driver in the retracted position thereof, guide jaws axially movable relative to said driver in said guide body between projected conjunct position on said driver for holding a fastener thus fed by said feeding means in front of said driver and a separated position in said guide body loose from said driver for releasing said fastener, releasable holding means in said driving tool movable in conjunction with said driver for clamping said guide jaws against said driver in said projected conjunct position of said guide jaws during driving movement of said driver together with said fastener held in front thereof towards a work piece into which said fastener is to be driven, and surfaces on said guide jaws cooperating with said fastener held therebetween for arresting said guide jaws in spaced relation to said work piece and for knocking them loose from said driver by release of said holding means the instant said fastener strikes against said work piece during the driving movement of said driver. The invention also relates to a driving tool magazine for band supported fasteners, more particularly for a driving tool of the above mentioned character in which a driver is carried axially movably in a guide body and a feeder is arranged in said magazine to bring the fasteners of the band, one after the other, forward to a feed opening while an ejector in said magazine is arranged to push the fasteners having thus been brought forward, out of the band via the feeding opening into the path of movement of the driver.



In such magazines the band has hitherto normally been directed to intersect the path of movement of the driver at which instant interference can occur as a result of broken-out band fragments following and subsequently jamming the movement of the driver. In prior use of magazine ejectors in combination with a band avoiding said path, the hitherto constructional suggestions have been complicated and costly. It is followingly an object of the invention to substantially simplify the construction of driving tool magazines of the character in question here by a simple and handy combination of the ejection and feeding functions.

For the hereinabove mentioned and other purposes there is according to another aspect of the invention provided in a driving tool including guide body, a driver axially movably carried in said guide body, and a feed opening on said guide body, a driving tool magazine for supplying fasteners supported by a band one after the other through said feed opening into the path of movement of said driver, said magazine comprising a housing, a rocker member pivotally journalled in said housing adjacent said guide body in a plane transverse to said driver, an ejector movably mounted in said housing pivotally on the one end of said rocker member for pushing a leading fastener out of the band via said feed opening into the path of movement of said driver when said one end is rocked towards said feed opening and for retracting said ejector when rocked away from said feed opening, a feeder movably mounted in said housing pivotally on the other end of said rocker member for feeding forward the next fastener in said band to said feed opening when said other end is rocked towards said feed opening and for retracting said feeder when rocked away from said feed opening, and means for alternately rocking the ends of said rocker member towards and away from said feed opening.

The above and other purposes of the invention will become obvious from the following description and from the accompanying drawings in which an embodiment of the invention is illustrated by way of example. It should be understood that this embodiment is only illustrative of the invention and that various modifications thereof may be made within the scope of the claims.

In the drawings,

FIG. 1 shows a side view of a driving tool embodying the invention.

FIG. 2 is a front view of the driving tool in FIG. 1.

FIG. 3 is an enlarged view partly in section on the line 3—3 in FIG. 1.

FIG. 4 is a view corresponding to FIG. 3 but showing another position of the details involved therein.

FIG. 5 is a longitudinal enlarged section of the forward portion of the driving tool seen on the line 5—5 in FIG. 2.

FIGS. 6 and 7 show the details in FIG. 5 during driving of a fastener.

FIG. 8 is a view shown partly in section on the line 8—8 in FIG. 5.

FIG. 9, finally, shows a fragmentary top view of a feed band for the driving tool.

In the figures the numeral **10** designates a band sustained driving tool such as a nailing machine or a powered screw driver. As an example suitable for description has been chosen the latter alternative, the screw driver **10** including a conventional pressure fluid driven vane motor, not shown, which over a suitable gearing, likewise not shown, drives the driving clutch part **11** in a clutch **11, 14**, FIG. **5**. At the forward end of the screw driver **10** is threadedly affixed a forwardly directed, partly cut-away outer sleeve **12**, in the interior of which is fixed a rearwardly disposed stop ring **13**. The driven clutch part **14** cooperating with the clutch part **11** abuts, when in uncoupled non-rotating position, against the stop ring **13**. The clutch part **14** carries an elongated driver **15** arranged in the outer sleeve **12**, which driver **15** in the screw driver application in question here carries a bit **16** forwardly thereon intended for cooperation with screws or fasteners **25** provided with screw driving grooves. Between the driving clutch part **11** and the driven clutch part **14** is inserted a spring **17** which bears against a cross pin **18** in the interior of the driver **15** and against the driving clutch part **11** through the intermediary of a ball **19**. The spring **17** normally moves the clutch parts **11, 14** apart, at which instant the driven clutch part **14** abuts against the stop ring **13** without rotating, while the ball **19** makes possible full rotation of the driving clutch part **11** with respect to the clutch part **14**.

The driver **15** projects axially slidably and rotatably into a guide body **20** which is made in one piece with a magazine housing **21** disposed transversely and perpendicularly thereagainst. The guide body **20** is arranged slidably in the outer sleeve **12** and is provided with a pair of long axial slots **22** which at the rear are terminated by canted abutment surfaces **23**. The guide body **20** is provided with a feed opening **24** for insertion of fasteners **25**. The housing **21** is covered by a cover **26** affixed thereto by screws and between the cover **26** and a setting nut **27**, which is threadedly and axially adjustable supported on the outer sleeve **12**, is inserted a helical spring **28** striving to move the guide body **20** to a projected position with respect to the outer sleeve **12** at which instant the driver **15** with the bit **16** takes retracted position within the guide body **20**, FIG. **5**.

In the slots **22** of the guide body **20** is loosely inserted a pair of elongated guide jaws **30** each of them rearwardly provided with a thickened end stop portion presenting a radially outward wedge abutment **31** adjacent and in front of the end stop portion. A holding means for the guide jaws **30** consists of a pair of wedge jaws **32** each inserted in an opening **33** arranged diametrically in the outer sleeve **12** and being biased radially inwardly by a spring ring **34** around the outer sleeve **12**. The holding means consisting of the wedge jaws **32** is intended for keeping the guide jaws **30** under spring pressure against the driver **15** in axially slidable abutting and non-rotating relation relative thereto in the slots **22**. In such abutting position the forward ends of the guide jaws **30** are disposed in a projected, resiliently brought-together or conjunct position in front of the bit **16** of the driver **15**, the guide jaws **30** thus being able to clamp, by way of an encircling laterally applied gripping action a fastener **25** that has been inserted in between the guide jaws **30** through the feed opening **24** such as to keep the fastener in position in frontal alignment with the bit **16** of the driver **15** during movement of the latter from retracted to projected position in the guide body **20**. The gripping action is achieved by way of suitable engaging surfaces cooperating with the fastener **25** to be gripped. Thus in case of headed fasteners **25**, the guide jaws are provided with suitable V-shaped recesses **30¹** adapted to the screw heads.

The guide jaws **30** may be retracted and knocked loose with respect to the wedge jaws **32** with the latter leaving and releasing the wedge abutments **31** and the guide jaws **30** sliding up on the driver **15** taking retracted separated position relative thereto, FIGS. **6, 7**. In such position the guide jaws **30** lie freely separated loosely in the slots **22** with the wedge jaws **32** disposed radially outwardly of the guide jaws **30** rearwardly of front stop lugs thereon. The wedge jaws **32** cooperate with the wedge abutments **31** and are pushed up on said abutments against the thickened rear end stops of the guide jaws **30** to stop forward projection of the guide body **20** relative to the outer sleeve **12** due to the action of the helical spring **28**. At such projection the abutment surfaces **23** of the slots **22** cooperate with rear end surfaces **35** on the guide jaws **30** so that the guide jaws **30** are moved forwardly in between the wedge jaws **32** to projected conjunct position relative to and against the driver **15**.

It is preferred to insert the fasteners **25** in a feed band **38** of plastic material, preferably polyethylene, provided with longitudinally spaced holes **39** into which the fasteners **25** are pushed perpendicularly relative to the band **38**, the holes **39** being arranged immediately adjacent one edge **38¹** of the band **38** so that it will be possible to project the fastening means **25** laterally out of the band while breaking through the edge portion thereof at the holes **39** when the fastening means **25** are to be moved through the feed opening **24** into the guide body. The cover **26** of the housing **21** is provided with a through guide passage **40**, FIG. **8**, for the band **38** and the housing **21** has a feeding slot **41**, FIG. **3**, for slidingly supporting the stems of fasteners **25**, said slot **41** running perpendicularly to the guide passage **40**. The feeding slot **41** is terminated at the feed opening **24**. On the feed housing **21** and the cover **26** thereof is carried pivotally a journal **42** to which is affixed an outer operating lever **48**. The journal **42** carries non-rotatably thereon a rocker member or arm **43** within the feed housing **21** which can be pivoted on the journal **42** between two limit positions, FIG. **3** and **4**, respectively, defined by a stop pin **49** in the housing **21**. At opposite sides of the journal **42** the arm **43** carries respectively an ejector **44** and a feeder **45**, both of them being pivotally journalled on the arm **43**. A plate spring **46** on the arm **43** strives to move the feeder **45** in between the fastener **25** in the feeding slot **41**. When the operating lever **48** is pivoted manually to rock the arm **43** in one direction, for example counter-clockwise from the position in FIG. **3** to the position in FIG. **4**, the ejector **44** is driven into the feed opening **24** feeding a fastener **25** by the stem thereof into the path of movement of the driver **15** and in between the guide jaws **30** and the recesses **30¹**, FIG. **5**, thereof. Simultaneously therewith the feeder **45** is moved back one step passing over the next fastener stem in the band **38**. In case of need, the band **38** is prevented from retreating out of

the guide passage 40 by an arresting dog 47 in the feed housing 21 which dog is moved by a plate spring 37 lockingly in behind the stem of the next fastener 25, the one after the other, as the feeder 45 brings them forward to the feeding slot 41. When pivoting the operating lever 48 for rocking the arm 42 clockwise from the position in FIG. 4 to the position in FIG. 3, the feeder 45 pushes forward the next fastener to the feed opening 24 simultaneously with the ejector 44 being drawn out therefrom.

With the ejector 44 thus having placed a fastener 25 between the guide jaws 30, the driving tool 10 will be started so that the driving clutch part 11 starts rotating. Thereupon the guide body 20 is placed against the workpiece and the driving tool 10 is forced forwardly against the action of the helical spring 28. This causes the outer sleeve 12 to move forward with respect to the stationary guide body 20, during which movement the fastener 25 being held between the guide jaws 30 follows the driver 15 and the outer sleeve 12 since the wedge jaws 32 force the guide jaws 30 radially inwardly frictionally against the driver 15. When the work piece 50 is contacted, the work piece being for example a plasterboard or a sheet metal panel, the fastener 25 is stopped dead in the forward motion thereof together with the guide jaws 30 while the wedge jaws 32 together with the outer sleeve 12 continue in forward direction together with the driving tool 10. Friction and cam action between the guide jaws 30 and the driver 15 causes that the driver 15, as well, tends to move rearwardly under compression of the spring 17, the spring force of which and the distances between the parts involved being calculated such that the driven clutch part 14 will mate with the driven clutch part 11 simultaneously with the wedge jaws 32 sliding down from the wedge abutments 31 on the guide jaws 30 and the latter moving apart and being knocked loose from the wedge jaws 32 thus released. The driver 15 starts rotating and the tip of its bit 16 rotates the fastener 25 by way of the driving groove therein. The mated position reached is illustrated in FIG. 6 and the released guide jaws 30 are lying non-rotatably in their slots 22 in the stationary guide sleeve 20 while the fastener 25 is screwed down into the work piece 50 into a pre-drilled hole therein by way of self-tapping or self-drilling. In FIG. 7 is illustrated the end stage of the driving, at which instant the increasing rotational resistance due to the screw head penetrating into the work piece 50 causes the clutch parts 11, 14 to disengage by conventional mechanism, not shown, and causes the rotation of the driver to cease. As an alternative and in case of pliable work pieces the setting nut 27 is adjusted such as to set the turns of the helical spring 28 to bear against one another just prior to the instant the head of the fastener has been screwed down fully into the work piece, the compressed spring windings thereby providing a forward limit stop for the driving tool 10. As a continuation the final driving of the screw head is then completed simultaneously with the clutch parts 11, 14 being disengaged from one another, the driver 15 being released when the head has been driven home.

When the driving tool 10 is retracted from the work piece, the helical spring 28 expands retracting the outer sleeve 12 and the driver 15 with respect to the guide body 20 and housing 21. During such movement the guide jaws 30 are taken rearwardly by the wedge jaws 32 engaging the thickened rear end stop thereon on towards the abutment surfaces 23, against which the rear end surfaces 35 of the guide jaws 30 come to rest simultaneously with the wedge jaws 32 sliding up on the wedge abutment surfaces 31. As a result the guide jaws 30 are subjected to spring load radially inwardly taking conjunct projected position for the next driving cycle, FIG. 5, in front of the driver 15 and its bit 16. In such position the operating lever 48 of the driving tool magazine will be rocked to and fro for feeding forward the next fastener 25 in between the guide jaws 30 as described hereinabove.

If it is desired to remove a fastener 25 that has been inserted between the guide jaws 30 away from the guide body 20 without driving it home, the magazine housing 21 is retracted manually towards the driving tool 10 to such an extent that front end surfaces 51 on the guide jaws 30 are struck by canted forward end surfaces 52 of the axial slots 22. As a result the guide jaws 30 are moved to retracted separated position and the fastneing means 25 falls out.

Obviously the guide jaw arrangement of the invention may advantageously be applied in driving tools without rotation, as well, primarily in tools for driving band supported nails or in tools wherein the nails are supplied in between the guide jaws 30 in other way.

I claim:

1. In a driving tool including guide body, a driver axially movably carried in said guide body, and a feed opening on said guide body, a driving tool magazine for supplying fasteners supported by a band one after the other through said feed opening into the path of movement of said driver, said magazine comprising a housing, a rocker member pivotally journalled in said housing adjacent said guide body in a plane transverse to said driver, an ejector movably mounted in said housing pivotally on the one end of said rocker member for pushing a leading fastener out of the band via said feed opening into the path of movement of said driver when said one end is rocked towards said feed opening and allowing said ejector to retract when rocked away from said feed opening, a feeder movably mounted in said housing pivotally on the other end of said rocker member for feeding forward the next fastener in said band to said feed opening when said other end is rocked towards said feed opening and allowing said feeder to retract when rocked away from said feed opening, and means for alternately rocking the ends of said rocker member towards and away from said feed opening.

2. A driving tool magazine according to claim 1 in which there is provided a guide passage in said housing for said band extending towards said feed opening in laterally off-set relation to the path of movement of said driver.

3. A driving tool magazine according to claim 2 in which said fasteners are supported in longitudinally spaced holes in said band substantially perpendicularly relative thereto, said housing being provided with a feeding slot for said fasteners extending along said guide passage and terminated at said feed opening, said guide passage passing all through said housing.

4. A driving tool magazine according to claim 1 in which said rocking means is a manually actuatable

lever, a journal in said housing for the pivotal supporting of said rocker member therein, and said lever connected to said journal outside said housing.

5. A feed band for a driving tool magazine according to claim 1 in which said fasteners are supported in longitudinally spaced holes in said band substantially perpendicularly relative thereto characterized by said holes being disposed immediately adjacent one edge of said band such as to permit said edge adjacent said holes to be broken through by said fasteners when ejected into said feed opening by said ejector.

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