May 3, 1966 P. D. CABOT ETAL 3,249,280

NAIL FEED MECHANISM

Filed Dec. 24, 1964 2 Sheets-Sheet 1

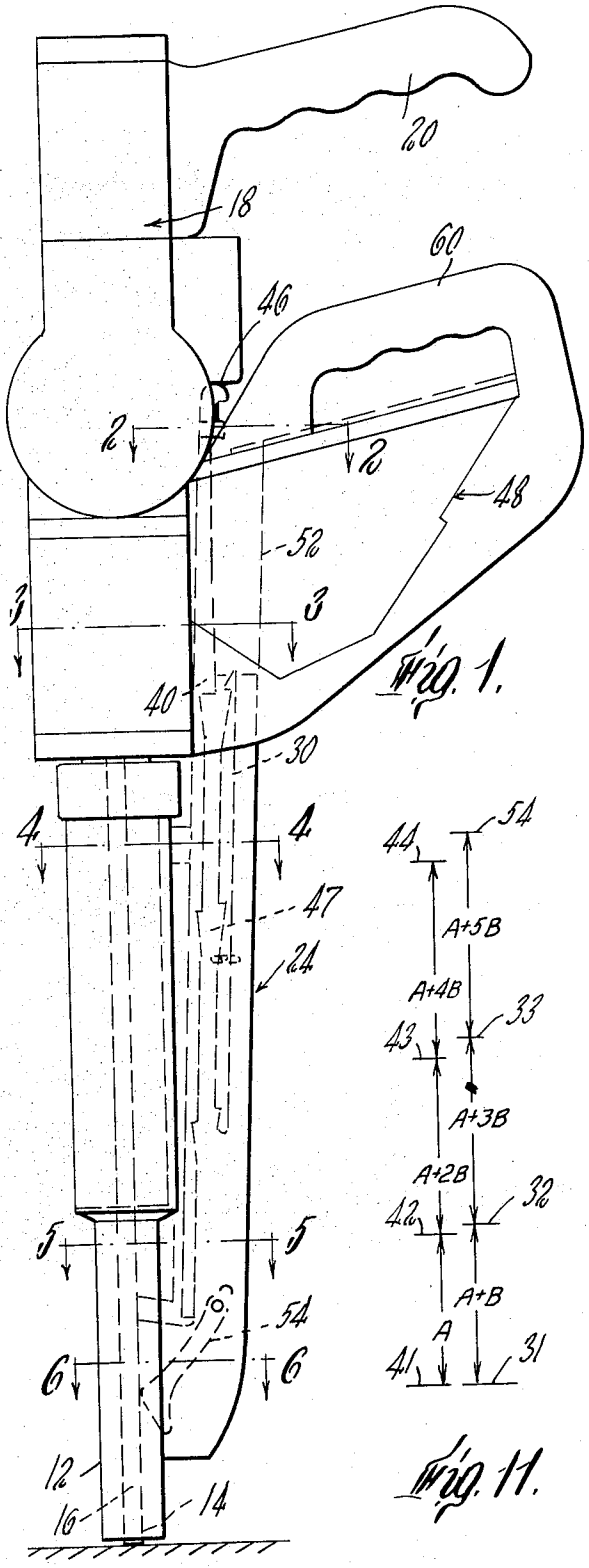


Fig. 1.

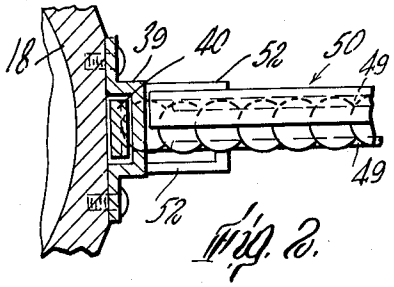


Fig. 2.

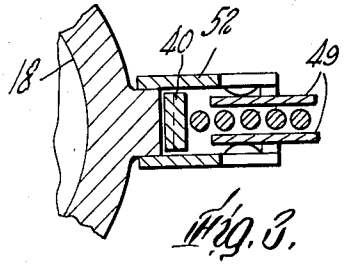


Fig. 3.

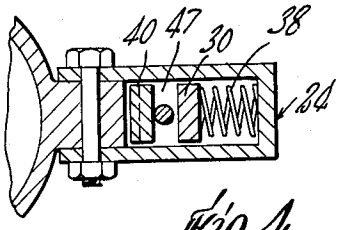


Fig. 4.

Fig. 11.

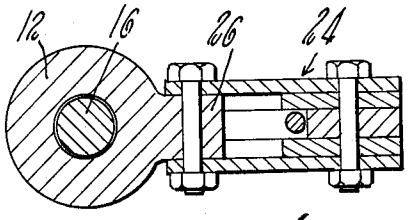


Fig. 5.

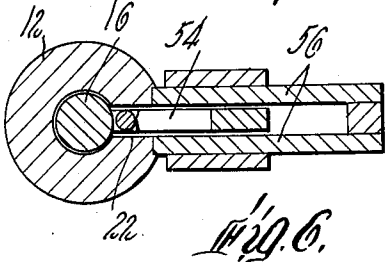


Fig. 6.

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NAIL FEED MECHANISM

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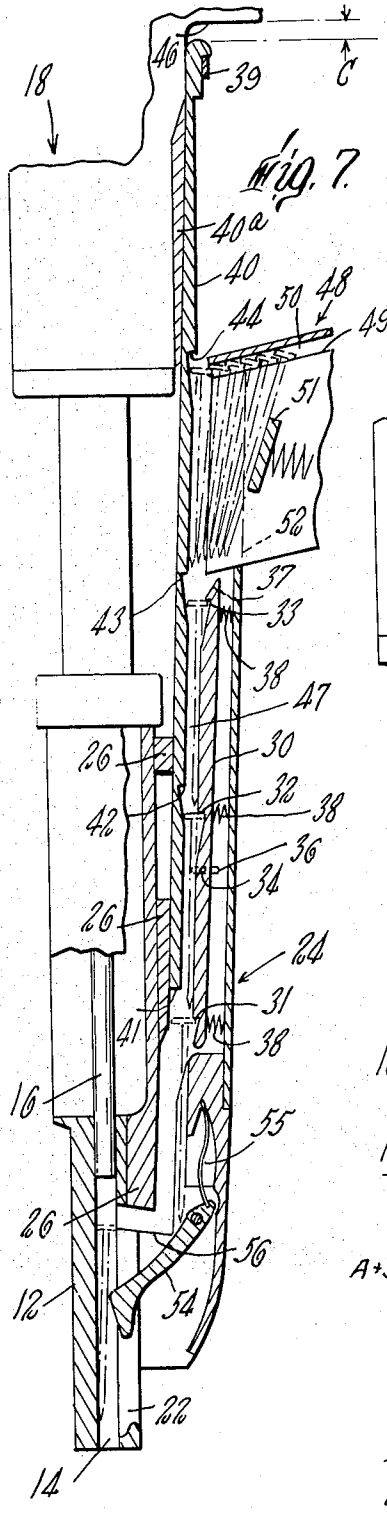


Fig. 7.

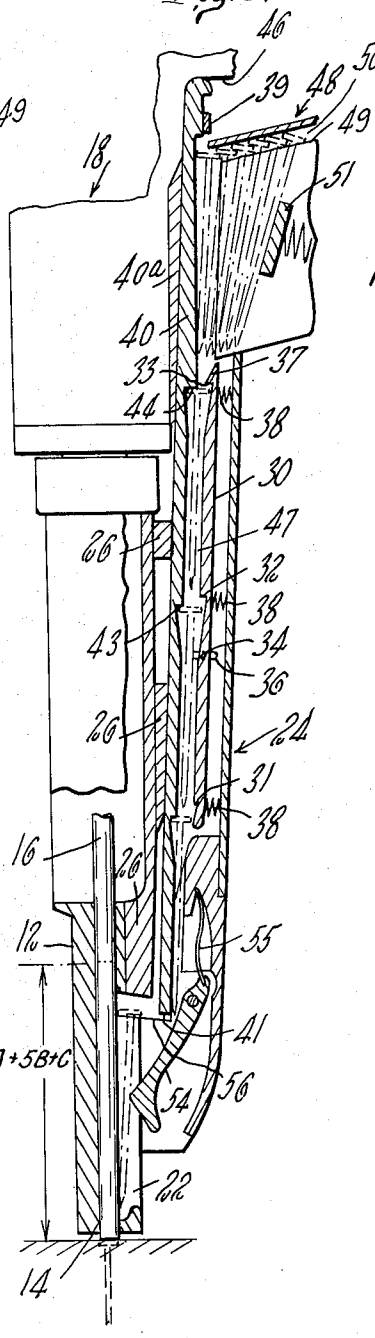


Fig. 8.

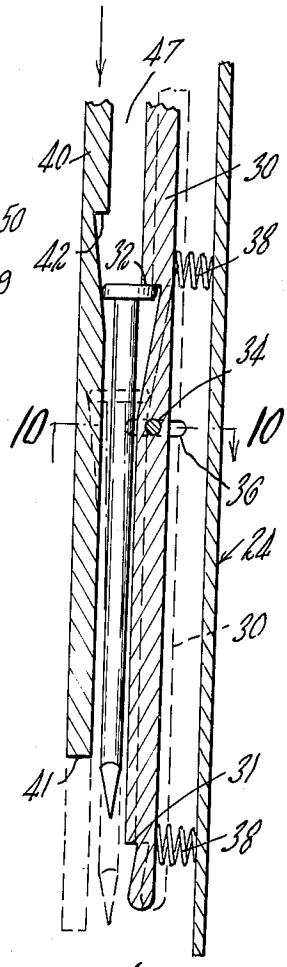


Fig. 9.

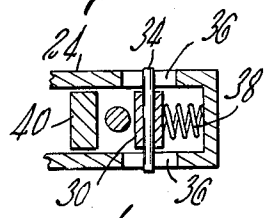


Fig. 10.

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NAIL FEED MECHANISM

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12 Claims. (Cl. 227—116)

This invention relates to a nail feeder, and more particularly, to an automatic nail feeder for controlledly passing headed nails in single file succession through a passageway leading to a point of desired use, for example, to a position for successive automatic injection into the barrel of a power nail driving tool.

Nails can be supplied to the entrance end of the feed passageway one by one, either manually or automatically by gravity or otherwise, from a magazine capable of inserting nails one by one sideways head-to-the-rear into the entrance end of the passageway.

The feeder can be so constructed as to constitute an attachment for a nail driving tool and for actuation by motions which are concomitant to normal operation of the tool.

A particular object of the invention is to provide an elongated nail feed passageway into the entrance end of which headed nails may be more conveniently fed with more accessibility than at a point adjacent its exit end. Thus, for example, in a preferred embodiment of the invention, a nail magazine of substantial capacity and hence, bulkiness, instead of being attached to the working end of a tool where it reduces the utility of the tool in narrow working spaces, is attached at a point remote from the working end of the tool, but connected thereto by the intervening feed mechanism of this invention.

A further object of the invention is to provide a nail feed attachment for power impact hammers which operates automatically to feed nails one by one to the working end of the tool as they are needed from a nail magazine positioned remote from the working end and concomitant to the normal motions of the tool in use and without requiring independent actuation.

A further object of the invention is to provide a nail feed mechanism which, though having moving parts and of considerable length, will be of an antijamming construction to insure that under no conditions of operation can one nail overtake a preceding nail along the feed passageway.

FIG. 1 is an elevational view of a nail feeding mechanism of the invention assembled with a nail driving tool;

FIG. 2 is a detailed cross-sectional view taken along the line 2—2 of FIG. 1;

FIG. 3 is a detailed cross-sectional view taken along the line 3—3 of FIG. 1;

FIG. 4 is a detailed cross-sectional view taken along the line 4—4 of FIG. 1;

FIG. 5 is a detailed cross-sectional view taken along the line 5—5 of FIG. 1;

FIG. 6 is a detailed cross-sectional view taken along the line 6—6 of FIG. 1;

FIG. 7 is an elevational view, partly in cross-section, and broken away at the top, showing the tool of FIG. 1 with parts thereof in a retracted position;

FIG. 8 is a view similar to that of FIG. 7 showing the parts in fully telescoped position;

FIG. 9 is an enlarged fragmentary cross-sectional view showing a nail in the feeding passageway and indicating, by dotted line position, the feeding motion thereof;

FIG. 10 is a cross-sectional view taken along the line of 10—10 of FIG. 9; and

FIG. 11 is a graphical representation of certain relative dimensions of the feed mechanism parts.

The nail driving tool of FIG. 1 has a lower barrel 12 having a bore 14 in which reciprocates an impact rod 16 driven by any suitable mechanism housed in the main casing 18. The casing 18 is telescopically mounted with respect to barrel 12 so that, as a nail is driven by the impact rod 16, the casing descends with respect to the barrel 12 into a collapsed position, as shown in FIGS. 1 and 8, but may thereafter be lifted into a retracted position by handle 20 so as to lift the rod 16 in the bore 14 to permit a further nail to be loaded into bore 14 below the end of rod 16, as shown in FIG. 7. Customarily, a spring tends to keep casing 18 and barrel 12 separated. In driving a nail, hand pressure on handle 20 compresses the spring.

In the tool shown, barrel 12 has adjacent its bottom end a longitudinal slot 22, through which a nail may be loaded into bore 14 while the rod 16 is in retracted position. A hollow nail feed housing 24 partially overlaps longitudinal slot 22 and extends up the same side of the barrel 12 above the slot 22, being clamped over and bolted to ribs 26 extending outwardly from the side of barrel 12 in alignment with slot 22.

A bar 30 having a series of inwardly facing notches forming a succession of downwardly facing abutments 31, 32 and 33 is hung inside housing 24 on a pin 34 (FIG. 10) which protrudes through a pair of opposed slots 36 in the housing side walls. The top of the bar is bevelled at 37 and the bar is urged inwardly by a series of three spaced compression springs 38 for yielding compound rocking movement within the housing.

An opposed inner slide bar 40 is fastened at its upper end to the tool casing 18 by being hooked under a strap 39 and protrudes down into housing 24 inside bar 30, and with its inside surface bearing at the top against a bevelled filler piece 40*a* fast on casing 18 and, lower down, against outer bevelled faces of the series of ribs 26. The bar 40 also has a series of notches which, taken with its forward end 41, form a series of downwardly facing abutments 41, 42, 43 and 44.

Slide bar 40 lies in the path of movement of a protrusion 46 on the tool casing 18 so that, as the tool casing begins its downward motion, the protrusion 46 first comes into engagement with the upper end of bar 40 and then moves it down into the position shown in FIG. 8 relative to the opposed bar 30.

The casing 18, with its attached slide bar 40, and the barrel 12, with its attached bar 30, thus constitute a pair of relatively slidable members forming between the two bars 30 and 40 a laterally expansible passageway 47 for accommodation and movement of nails down the side of barrel 12 after they are inserted into the top entrance of passageway 47 below the rear abutment 44 of the slide bar 40, one at a time at each full retraction of the tool casing.

While the nails may be manually fed into the top of the passageway 47, a slotted magazine or clip 48 of known construction which has spaced nail-head supporting shoulders 49 forming a chute 50 and includes a spring pusher 51 urge a single row of nails sideways towards and into engagement with the slide bar 40. The chute walls extend inwardly between side wall extensions 52 of housing 24.

The inside contour of the bottom of housing 24 is such as to contain a swing latch 54 constantly urged into barrel slot 22 by a spring 55. This latch 54 is swung back as a nail is pushed downwardly by the end 41 of inner slide bar 40 to bring its head into engagement with spaced shoulders 56, its head then clearing the bottom of lowest rib 26, whereupon the latch pushes the nail through slot 22 unless impeded by the presence of a previously positioned nail or rod 16.

The antijamming feature of the invention resides in

the relative spacings of the abutments **31**, **32** and **33** with respect to the spacings of the abutments **41**, **42**, **43** and **44**. These spacings are graphically shown in FIG. 11 wherein the distance between **31** and **32** on bar **30** exceeds, by an increment of B, the distance A between abutments **41** and **42** on slide bar **40**; the distance between abutments **42** and **43** on slide bar **40** exceeds A, by 2B; that between **32** and **33** exceeds A, by 3B; that between **43** and **44** exceeds A, by 4B; and that between **33** and the top of the most advanced nail (indicated in FIG. 11 as **54**) in chute **50** exceeds A, by 5B; A and B being constant throughout. In this way, as slide bar **40** is retracted, its bottom end abutment **41** will necessarily pass by abutment **31**, before abutment **42** passes abutment **32**; abutment **43** will not pass abutment **33** until after abutment **42** has passed abutment **32** and so on.

Accordingly, one is assured that if there is only a partial retraction of the inner bar **40**, it can never pick up a succeeding nail in the line of succession in passageway **47** for advancing downward movement until it has already picked up every preceding nail in the line of succession. Overlapping and, hence, jamming of the nails in the passageway is thus precluded.

Similarly, one is assured that on an advancing stroke from full bar **40** retraction, starting with **44** (FIG. 11) above **54**, abutment **43** cannot deliver a nail to abutment **32** before **42** has delivered any preceding nail to **31**; and **44** cannot deliver a nail to **33** until **43** has delivered any preceding nail to **32**. Thus, if there is a full forward stroke, each nail will be advanced a full step to in front of the next bar **30** abutment, timewise, in their order of succession. Hence, if there is only a partial forward stroke of bar **40**, no succeeding nail in the succession of nails in the passageway will ever be delivered a full step to a next bar **30** abutment before all preceding nails in the passageway have positively been delivered their full step to the next bar **30** abutment.

In addition, then, to preventing jamming of the nails in the passageway because of only a partial retractive stroke, jamming of the nails in the passageway will also be precluded despite an interrupted forward stroke. In short, no matter how far, or in what direction, the barrel and casing of the tool are telescopically moved relative to one another, and nails in the passageway **47** will remain in a separated order of successsion and a proper feed of a single nail to bore **14** can be reliably accomplished whenever bore **14** is empty merely by fully retracting the casing and then advancing it through one or more full strokes until the first nail in the line of succession is delivered to the bore.

It will be understood that the resilient action of the outer bar **30** holds each nail frictionally against the opposing surface of slide bar **40** so that no nail will move downwardly except when propelled by a bar **40** abutment and can never be moved by frictional engagement with bar **40** upwardly past any abutment on bar **30** which it has previously passed down beyond.

It will be further understood that a greater or less number of abutments may be provided on the bars **30** and **40** depending upon the length of the stroke of casing **18** relative to barrel **12** and the penny size of the nails being fed. In any event, the stroke of bar **40** should be such that all but its lowermost and uppermost abutments will pass by two opposing bar **30** abutments in each full stroke so that they (or it) pick up any nails lodged against upper bar **30** abutments and propel their heads to or a little beyond the next lower bar **30** abutment, by which they each will be engaged as the slide bar is retracted. Thus in FIG. 9, the head of the nail shown has, during a retraction stroke of slide bar **40**, lodged against abutment **32**. As bar **40** moves down on the next stroke, abutment **42** will engage the nail head from the opposite side and move it downwardly with respect to bar **30** to

the dotted line position and ultimately advance the head beyond the next lower abutment **31**.

The lost motion provided by the attachment of slide bar **40** to casing **18** through strap **39** is required in the form of the invention shown in the drawings so that the total possible stroke of impact rod **16** with respect to barrel **12**, shown by the scale line in FIG. 8, will be greater than the stroke of slide bar **40**. Otherwise, impact rod **16** might either not clear slot **22** on the upward stroke of casing **18** or not countersink the nail by moving beyond the end of barrel **12** when the casing is fully collapsed down onto barrel **12**.

In practice, the stroke of slide bar **40** for the device shown in the drawings must be at least A and 5B to insure that abutment **44** passes abutment **33** on the downward stroke. The total stroke of impact rod then is at least A and 5B and C, where C represents the space, at full retraction of casing **18**, between protrusion **46** and the top of bar **40**.

A handle **60** may be superimposed over the magazine **48** and made fast to housing extensions **52**. In such case, the handle **20** though shown in the drawings as being in the plane of handle **60** can better be radially off-set from handle **60**, for example by 90°, so that the handles may more readily be grasped in separate hands for separating motion to cock the nail feed mechanism.

It will also be understood that impact rod, by virtue of electrically driven cam or other reciprocating mechanism housed in casing **18** and constituting no part of this invention, has a rapid short repetitive nail driving stroke with respect to casing **18** entirely independent of the relative telescoping motion of casing **18** relative to barrel **12**.

What is claimed is:

1. A nail feed mechanism comprising

a pair of opposed relatively slidable members forming therebetween an intervening confined passageway for single-file passage of headed nails;

a series of forwardly facing spaced abutments on each of said members for engaging, from opposite sides of said passageway, the rear surfaces of heads of nails passing point-first along said passageway;

one of said members being slidably movable relative to the other member from a fully retracted position whereat successive abutments on said one member are retracted behind successive abutments on said other member to a fully advanced position whereat each of the abutments other than the first and the last in the series of abutments on said one member has moved past two adjacent abutments on said other member to advance a single file progression of nails, inserted in succession into said passageway in front of said last abutment on said one member, step-by-step from abutment to abutment of said other member along said passageway with each full stroke of said one member.

2. A nail feed mechanism as claimed in claim **1** wherein the series of abutments on said other member are mounted for resilient movement towards and away from said one member to provide a yieldingly expansible passageway therebetween for yieldingly accommodating the heads of nails passing therethrough.

3. A nail feed mechanism as claimed in claim **2** wherein the resiliently mounted series of abutments are mounted for rocking movement with respect to the axis of said passageway.

4. A nail mechanism as claimed in claim **1** which includes a longitudinal slot in the side of said other member adjacent the rear end of said passageway for insertion of nails sideways into said passageway in front of said last abutment of said one member in its fully retracted position.

5. A nail feed mechanism as claimed in claim **1** which includes a longitudinal slot in the side of said other member adjacent the rear end of said passageway for insertion

of nails sideways into said passageway in front of the rear abutment on said one member in its fully retracted position and a longitudinal slot in the other side of said other member adjacent the exit end of said passageway for passage of nails one at a time sideways out of such passageway from in front of the forward abutment of said one member in its fully advanced position.

6. A nail feed mechanism as claimed in claim **5** wherein said other member includes a barrel of a nail driving tool and the nail exit end of said passageway communicates with a longitudinal slot in said barrel through which nails emerging from the exit end of said passageway may pass sideways into said barrel into a position to be driven by said nail-driving tool.

7. A nail feed mechanism as claimed in claim **6** wherein said one member includes a nail-driving tool casing which reciprocates with respect to said barrel and moves towards said barrel as a nail is driven out of said barrel by said nail-driving tool.

8. A nail feed mechanism as claimed in claim **1** where the distance between said abutments of at least one of said members progressively increases from the nail exit to the nail entrance end of said passageway.

9. A nail feed mechanism as claimed in claim **1** wherein said members comprise, respectively, a casing for the nail driving mechanism of a nail-driving tool having a reciprocating impact rod and a barrel telescopically mounted on said casing providing a bore within which said rod reciprocates, and said passageway extends from a point remote from the end of said barrel to a point adjacent the end of said barrel, offset from said bore.

10. A nail feed mechanism as claimed in claim **9** wherein said series of abutments on said casing have lost motion with respect to the telescoping motion of said casing relative to said barrel, whereby the stroke of said telescoping motion is greater than the stroke of said casing series of abutments.

11. A nail feed mechanism as claimed in claim **1** wherein the distance between the abutments on both of said members progressively increases by a uniform increment from the nail exit to the nail entrance end of said passageway.

12. A nail feed mechanism as claimed in claim **11** wherein the distance between the first two abutments on said one member nearest the nail exit end of said passageway is less than the distance between the first two abutments on the other member nearest the nail exit end of said passageway and during retraction of said one member, its series of abutments moves past the opposite series of abutments progressively from front to rear of said passageway, whereby the head of a nail in said passageway lodged against a succeeding abutment in said opposite series will not be passed on a retractive stroke by a succeeding abutment on said one member before the head of every nail in said passageway lodged against a preceding abutment in said opposite series has been passed by a preceding retracting abutment.

No references cited.

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