

March 8, 1966

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3,238,983

PORTABLE NAILING MACHINE

Filed May 21, 1963

4 Sheets-Sheet 1

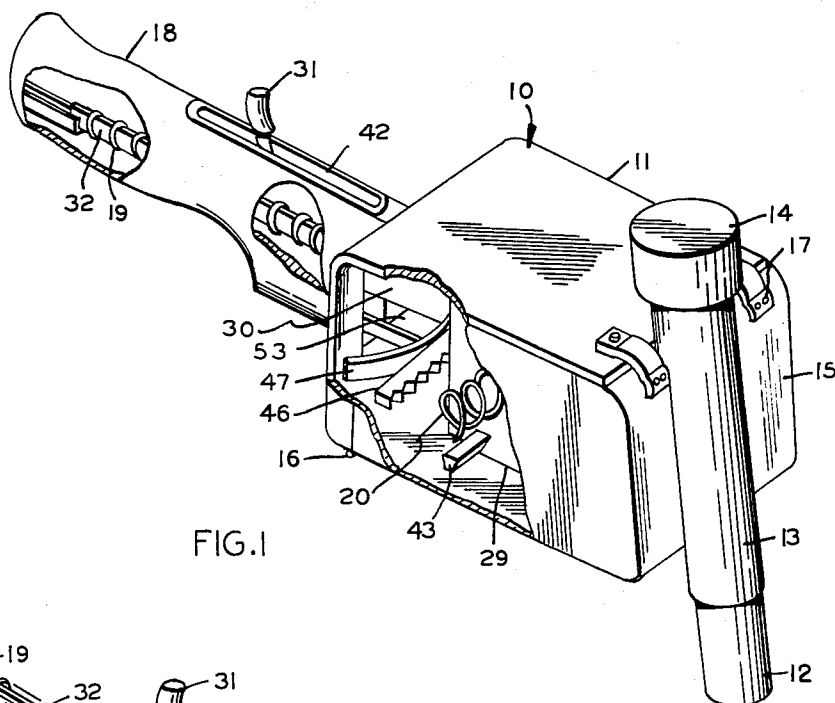


FIG. 1

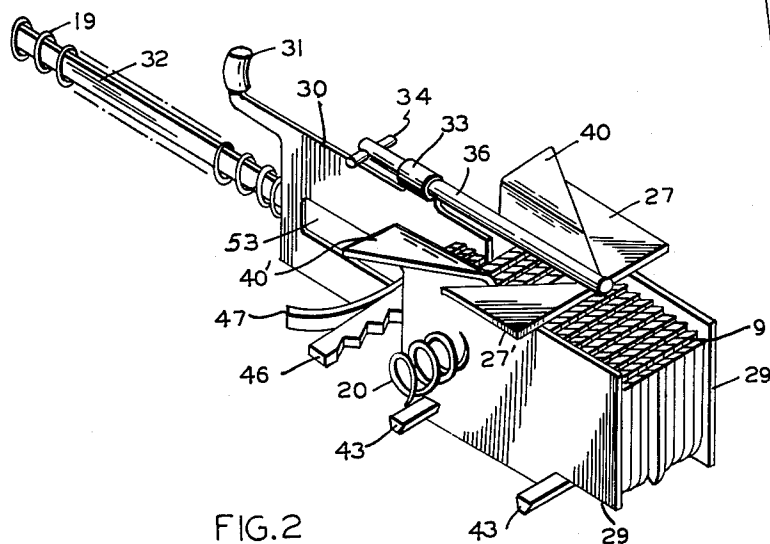


FIG. 2

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4 Sheets-Sheet 2

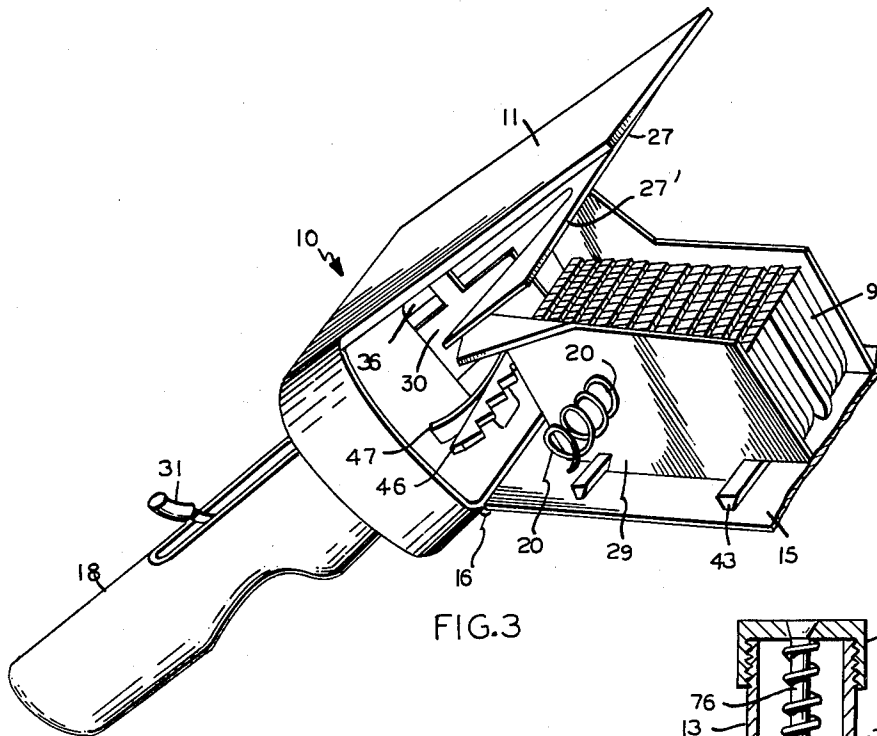


FIG. 3

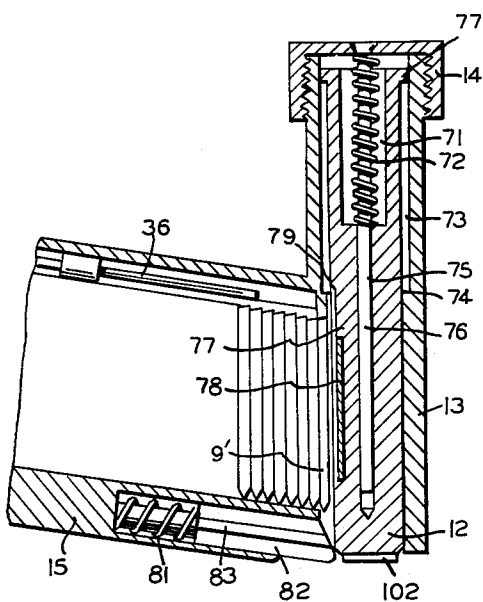


FIG. 4

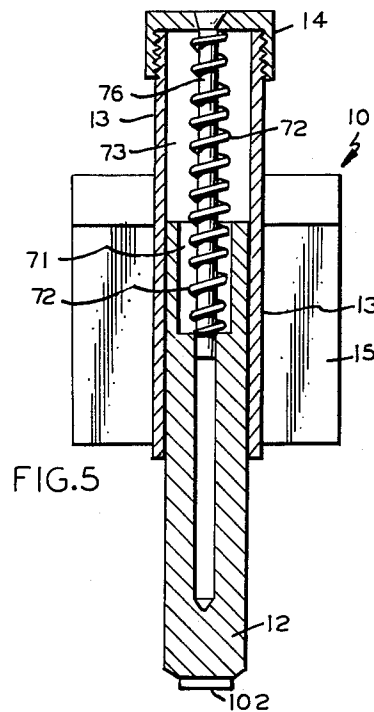


FIG. 5

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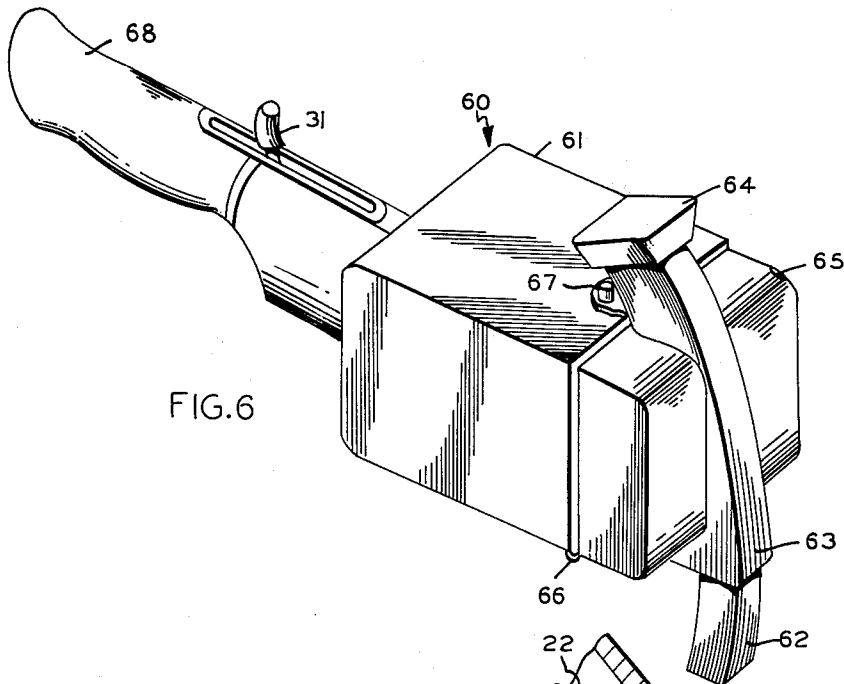
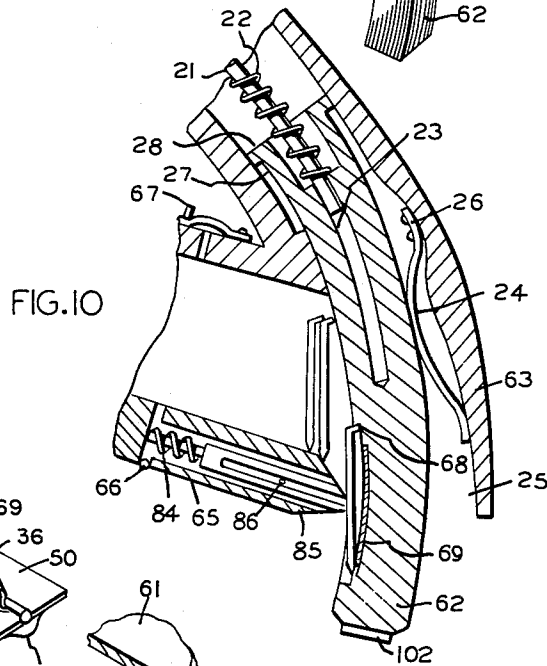
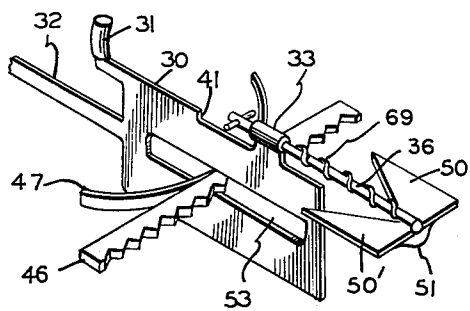
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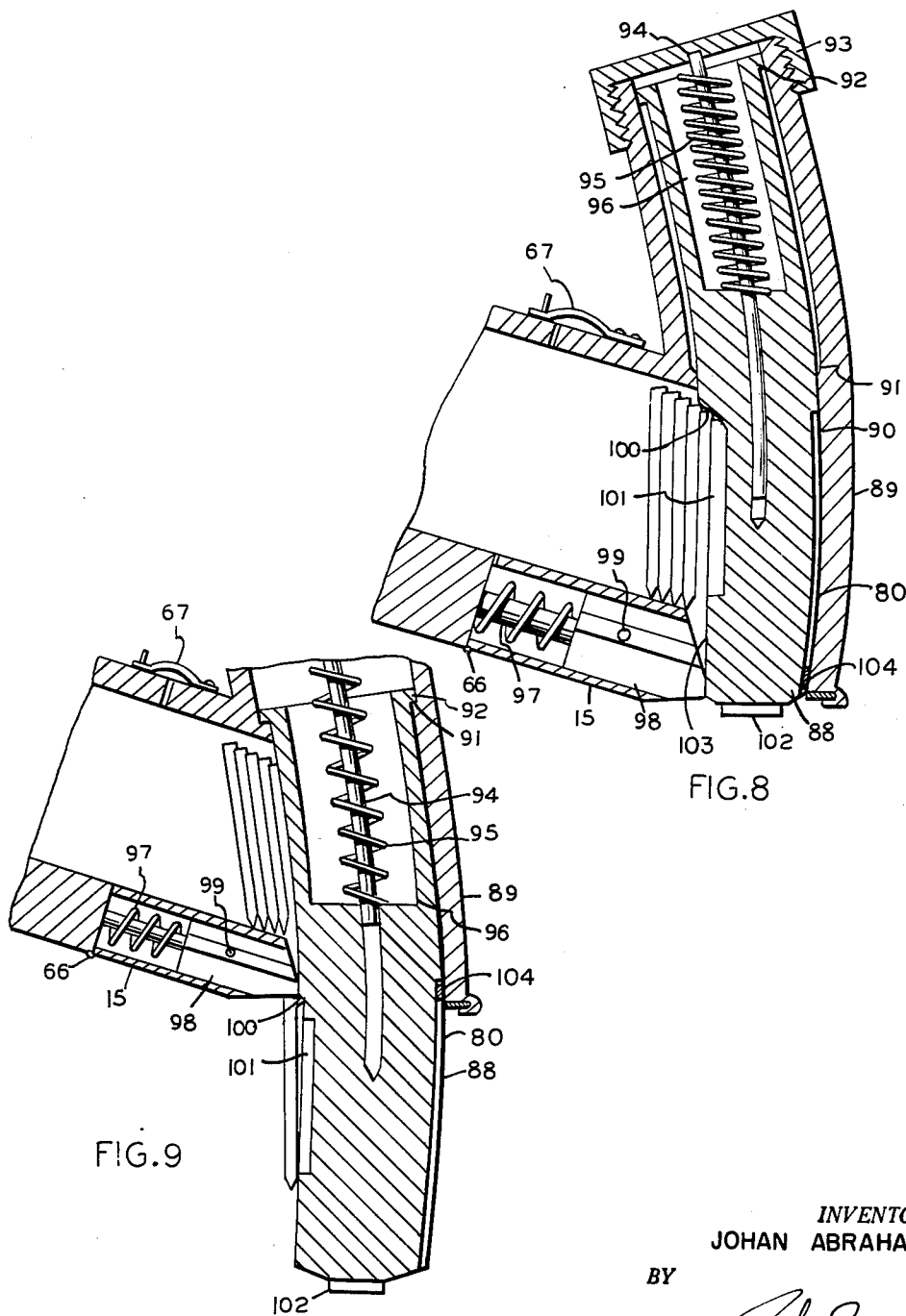
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4 Sheets-Sheet 4



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PORTABLE NAILING MACHINE
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Filed May 21, 1963, Ser. No. 266,780
6 Claims. (Cl. 145—30)

This invention relates to a hand wielded portable nailing machine and more particularly to a device which is comprised of a handle portion in which there is enclosed a nail magazine and feed mechanism, and of a head portion in which there is enclosed a nail guide and nail transfer plunger. The machine is used in a manner similar to the manner in which a conventional hammer or mallet is used, that is, it is swung forcibly against work to be nailed so as to drive a nail by imparting the kinetic energy present in the propelled device to the nail to be driven.

The device of this invention differs from existing nailing machines by transferring the inertial energy of the frame, and portions fixedly attached thereto, to the nail rather than the inertial energy of the plunger to the nail as is the case in conventional nailing machines.

The spring loaded plunger of the instant device extends downwardly and beyond the frame of the device during the time that the machine is removed from contact with a work surface. The plunger incorporates a magnet which attracts and holds an iron nail thereagainst in position for driving. When the device is swung into contact with a work surface the extended plunger abuts against the surface and becomes stationary relative thereto and is driven upwardly relative to the frame of the device. The head of the nail is contacted by the impact head of the device which is integral with the frame thereof, and is operably driven into the work, being guided thereto by the plunger extension.

The machine may be made suitable for driving a variety of headed fastening means such as staples or iron or iron alloy rivets, as well as for driving nails.

Previous nailing machines have required that nails be driven by striking a mallet or hammer blow upon the head of a plunger thereby forcing a nail into a desired material. Since one hand of the operator on such an operation is required to wield a hammer and the other hand is required to maintain the device in the desired position it has frequently occurred that the hammer has rebounded from the head of the plunger and has come in contact with the hand utilized to position the device thereby causing pain to the operator and, in the case of nails which have been only partially seated, damaging the nail as a result of the movement of the device.

Previous devices have proven very difficult to manipulate due to their weight and bulk and are especially awkward for use in overhead or wall nailing where they have had little or no utility.

Another disadvantage of existing devices is that a large amount of initial energy in the hammer or mallet blow is dissipated in the head of the plunger due to the necessity of making the head of plastic, rubber, lead or similar resilient or malleable composition.

It is an object of this invention to provide an improved nailing machine.

Another object is to provide a nailing machine that can be operated in substantially the same manner as an ordinary hammer or mallet.

Another object is to provide a nailing machine of relatively light weight and little bulk.

Another object is a nailing machine having a semi-automatic magazine therein.

Another object is a nailing machine wherein every nail driven thereby is driven in a straight fashion.

A still further object is a nailing machine that may be

2

filled with stacks of nails in a relatively quick and easy manner.

Other objects will become apparent from the drawings and from the following description in which it is my intention to illustrate the applicability of the invention without thereby limiting it to a scope less than that of all equivalents which will become apparent to one skilled in the art and in which like references refer to like parts and in which:

FIGURE 1 is a perspective view in cutaway of one embodiment of the device of this invention;

FIGURE 2 is a perspective view of a portion of the machine of the device of FIGURE 1;

FIGURE 3 is a perspective view of a portion of the device of FIGURE 1 showing a magazine of the device in open position suitable for being loaded;

FIGURE 4 is a cross-sectional elevation of the nail-driving mechanism of the nailing machine of FIGURE 1;

FIGURE 5 is a cross-sectional front elevation of the device of FIGURE 4;

FIGURE 6 is a perspective view of another embodiment of the nailing machine of this invention;

FIGURE 7 is a perspective view of a portion of the nailing machine of FIGURE 6;

FIGURE 8 is a cross-sectional side elevation of the driving head of the nailing machine of FIGURE 6;

FIGURE 9 is a cross-sectional side elevation of the device of FIGURE 8 in changed position;

FIGURE 10 is a cross-sectional side elevation of a portion of another embodiment of the nailing machine of FIGURE 6.

Referring now to FIGURE 1, there is shown nailing machine 10 comprising handle 18, plunger 12, plunger casing 13, plunger casing cap 14 and magazine casing 11 and 15 pivotally connected by hinge 16 and fastened together by clasp 17. Plunger casing 13 and magazine casing 15 are integral and preferably comprise a metal casting but may be welded or otherwise fastened together. Within magazine casings 11 and 15 is shown pusher bar 30 with which guide rod 32 in handle 18 is integral. Ratchet 46 and spring-biasing means 47 are shown extending through slot 53 in pusher bar 30 with ratchet 46 operably engaged with the rear edge of side plates 29 of the magazine. Side plates 29 are biased away from the center line of the magazine by means of tension springs 20 which are fixedly connected to casing 15 of machine 10. Compression spring 19 on guide rod 32 biases pusher bar 30 to the right as shown through the nail magazine thereby advancing the center file of nails in the magazine to plunger 12.

Referring now to FIGURE 2 nails 9 (which may either be loose or weakly adhered together to facilitate handling) are shown arranged in rank and file order between side plates 29 with pusher bar 30 contacting the rear edge of the centermost file of nails. Shaft 36 is slidably connected to pusher bar 30 by means of collar 33 on pusher bar 30. Pin 34 extending through rod 36 prevents the rearmost extremity of rod 36 from being passed through collar 33 while members 27 and 27' affixed to the forward-most portion of shaft 36 restrict movement of shaft 36 rearwardly through collar 33. Members 27 and 27' are configured as similar triangles with member 27 being larger than member 27'. Members 27 and 27' operably engage lateral wings 40 and 40' respectively on side plates 29. Lateral wings 40 and 40' are symmetrical and are preferably of equal size thereby enabling engaging contact of wing 40 with member 27 to be made as shown in FIGURE 2 but not enabling contact of wing 40' with member 27' to be established simultaneously because of the unequal sizes and lateral dispositions of members 27 and 27'. Side plates 29 are biased inwardly toward the center of the magazine by the lateral component of force

3

exerted by members 27 and 27' on wings 40 and 40' against the force of tension springs 20. The lower edges of side plates 29 extend between tracks 43 affixed to casing 15 so that movement of side plates 29 in the magazine is restricted to lateral movement only.

In FIGURE 3 nailing machine 10 is shown in open position to enable access to the magazine to be made for loading nails 9 thereinto. Pusher bar 30, shaft 36 and members 27 and 27' are associated with handle 18 and casing 11 of nailing machine 10 and are rotated away from magazine casing 15 and the forward part of the machine when the device is opened. Ratchet 46 and spring biasing means 47 are withdrawn from contact with side plates 29 by opening of the magazine thereby enabling tension springs 20 to bias side plates 29 outwardly to enable loading of the magazine to be accomplished. Handle 31 on pusher bar 30 is maintained in retracted position until the machine is closed so that the forward portion of pusher bar 30 does not interfere with nails 9 in the magazine.

Referring now to FIGURES 4 and 5, there is shown plunger casing 13 and plunger casing cap 14 of machine 10. The foremost nail 9' of the center file of nails in the magazine of machine 10 abuts against plunger 12 as shown in FIGURE 4. Plunger 12 comprises spring well 71 therein, flange 77 around the uppermost extremity thereof, magnet 78 encased therein adjacent nail 9', and cushion 102 on the bottommost extremity thereof to provide a non-marring surface thereunder. Plunger casing 13 is counter-bored with counter-bore 73 extending a portion of its length to enable flange 77 on plunger 12 to move longitudinally within casing 13 but to limit movement of plunger 12 so as to prevent plunger 12 from being removed from casing 13 through the bottom opening thereof. Cap 14 is screwed onto casing 13 to provide a top cover therefor and guide rod 76 is fixedly attached thereto. Compression spring 72 abuts against cap 14 and against plunger 12 at the bottom of spring-well 71 thereof. Slidable driving head 82 is biased by spring 81 against plunger 12 immediately below the nail magazine of nailing machine 10. Guide key 83 is provided in driving head 82 and is received in a recess in casing 15 of nailing machine 10. In unactuated position plunger 12 of machine depends from plunger casing 13 as shown in FIGURES 1 and 5 and when actuated is driven upward into plunger casing 13 against the force of tension spring 72 to the position shown in FIGURE 4. In such position foremost nail 9' in machine 10 abuts against plunger 12 immediately below shoulder 79 of plunger 12.

In operation, nailing machine 10, as shown in FIGURES 1 through 5, is grasped by an operator about handle 18 and is swung against work to be nailed thereby driving plunger 12 into plunger casing 13. When plunger 12 reaches the position shown in FIGURE 4 with shoulder 79 above the head of nail 9', nail 9' advances under shoulder 79 into adjacency with magnet 78. The centermost file of nails 10 in the magazine of machine 10 (behind nail 9') is biased forwardly by the action of compression spring 19 on pusher bar 30, pusher bar 30 being operably biased into contact with the rearmost edge of the centermost file of nails in machine 10. When nailing machine 10 is lifted from the work, plunger 12 is extended downward by the action of compression spring 72 with nail 9' being forced downward by shoulder 79 in plunger 12 against the inclined front surface of driving head 82 and causing spring 81 to be compressed until the head of nail 9' is disposed below driving head 82 whereupon driving head 82 returns to a position of abutting contact with plunger 12. Magnet 78 retains nail 9' in contact with the lower extremity of plunger 12 which depends below plunger casing 13. Machine 10 upon again being swung against the work surface operably causes nail 9' to be driven home by plunger 12 receding into casing 13 by the impact of machine 10 against the work being nailed while nail 9' abuts against the

4

lower surface of driving head 82 thereby being driven into the work. In the position shown in FIGURE 4, while nail 9' is being driven, plunger 12 picks up the foremost nail in the centermost file of nails in the magazine in a manner identical to that described for nail 9' and the operation is repeated. When the centermost file of nails in the magazine of nailing machine 10 is exhausted by pusher bar 30 being biased forward through the magazine delivering each nail in turn to plunger 12, handle 31 on pusher bar 30 is retracted by the operator thereby causing pusher bar 30 to be withdrawn from between files of nails in the magazine and causing shaft 36 to be withdrawn by collar 33 on pusher bar 30 abutting pin 34 in shaft 36 and causing either member 27 or 27' on shaft 36 to be brought into contact with wing 40 or 40' as the case may be, on a side plate 29. The side plate 29 contacted is transversely biased in the magazine in operable manner to displace certain of the files of nails in the magazine inwardly thereby providing a new centermost file of nails against which pusher bar 30 can abut when handle 31 is released by the operator. The nailing operation is again repeated until the nails in the centermost file are again exhausted, whereupon pusher bar 30 is again retracted and member 27 or 27' which was not utilized in the next preceding operation for positioning the centermost file of nails in the magazine contacts wing 40 or 40' as the case may be, and biases that plate inwardly in the magazine to provide the next centermost file of nails. The operation of wings 27 and 27' is alternate because each time one of plates 29 is biased inwardly it is biased a discrete amount along ratchet 46. The biasing of one of plates 29 is stepwise and uniform in response initial force exerted by member 27 or 27' to crest a ratchet tooth and is completed by force exerted by spring biasing means 47 to move side plate 29 into a groove between teeth on ratchet 46. When pusher bar 30 is retracted at the next instance when nails in the magazine of machine 10 need be repositioned, the alternate member 27 or 27' will again contact side plate 29 with which it is associated and cause that plate to be biased a discrete amount.

Therefore, when each tooth on ratchet 46 is spaced away from next in adjacency by an amount equal to the width of one file of nails, plates 29 will be biased alternately toward the center of the magazine by repetitively retracting pusher bar 30 so as to enable another file of nails to be aligned in the magazine ahead of pusher bar 30 and to be exhausted from the magazine by movement of pusher bar 30.

Wings 40, 40' will never be equally spaced from the center because of the spacing of teeth on ratchet 46. The teeth on ratchet 46 are arranged in unsymmetrical fashion, so that as side plates 28 slip into the recess between the teeth on said ratchet, wings 40 and 40' are always arranged so that contact with members 27 and 27' cannot occur simultaneously. Thus, as side plates 29 move together as files of nails are used up, members 27, 27' engage first wing 40, then wing 40', then again wing 40, etc., as the side plates 29 move together as required by the spacing on the teeth on ratchet 46.

Cam 51 will first contact side bars 29, which are in close adjacency since the last file of nails has been ejected. After contacting side members 29, cam 51 will have elevated members 50, 50' above the level of wings 40, 40'. As pusher bar 30' is withdrawn still further, cam 51 rides from side plates 29 to the upper surface of wings 40, 40'.

When clasps 17 are released and handle 18 is depressed to open the magazine of nailing machine 10, ratchet 46 is removed from contacting adjacency with side plates 29 and the latter members are biased outward by tension springs 20 and enable nails to be loaded thereinto. The magazine is easily accessible and may be rapidly loaded. The pusher bar may then be retracted and the magazine closed and clasps 17 fastened to again ready nailing machine 12 for operation.

In FIGURE 6 is shown another embodiment of the de-

5

vice of this invention. Machine 60 is similar to machine 10 of FIGURES 1-5 except that the nail driving mechanism comprising plunger 62 and plunger casing 63 are arcuate rather than straight as in machine 10. Plunger 62 and plunger casing 63 are preferably substantially of square cross section to facilitate machining and manufacture of the device. It may be readily understood that they might also be of substantially cylindrical configuration similar to the plunger and casing of machine 10, or conversely plunger 12 and casing 13 of FIGURE 1 might be similar in cross section to the plunger and casing of FIGURE 6. The magazine casing of nailing machine 60 is comprised of members 61 and 65 hingedly connected by hinge 66 and fastened together by clasp 67. Hinge 66 and clasp 67 are both disposed substantially forward in machine 60 so that the magazine is disposed entirely within the rear portion of nailing machine 60 comprising casing 61.

Referring now to FIGURE 7, the magazine of nailing machine 60 is shown to be similar to that of machine 10 of FIGURE 2 but comprised with compression spring 69 on the forward portion of shaft 36 and with members 50 and 50' configured substantially identical to members 27 and 27' of FIGURE 2 but having cam member 51 affixed to the frontmost extremity of shaft 36 and depending therefrom. Pusher bar 30' is configured with shoulder 41 disposed along the top edge thereof and exposed to operably engage the frontmost extremity of slot 42 (FIGURE 1) when handle 31 of pusher bar 30' is elevated slightly when pusher bar 30' is in completely retracted position. A portion of casing 61 is shown in FIGURE 7 provided with inclined member 52 which the frontmost end extremity of shaft 36 contacts when pusher bar 30' is moved forward in the magazine of machine 60. Member 52 causes the frontmost extremity of shaft 36 is to be depressed and thereby causes pusher bar 30' to be depressed an approximately equal amount made with shaft 36 by collar 33. Compression spring 69, cam 51 and inclined member 52 are provided to enable nailing machine 60 to be opened about hinge 66 in a manner such that nails may be loaded in the rear half of the machine. The magazine of machine 60 may then be associated with the rear half of the machine rather than the forward half as shown in machine 10 of FIGURE 1. The operation of machine 60 is similar to that described for machine 10 except that when the magazine of machine 60 is exhausted of nails, pusher bar 30' is fully retracted and ratchet 46 is biased to the rear by the front end of slot 53 in pusher bar 30' being drawn against ratchet 46 thereby forcing the latter member backward out of contacting relation with side plates 29 and enabling tension springs 20 to bias side plates 29 outward to facilitate refilling the magazine. Wings 40 and 40' are contacted by V configured cam 51 thereby causing cam 51 to be elevated in operable manner by riding upward on side plates 29 and onto wings 40 and 40'. With shaft 36 affixed to cam 51 triangular members 50 and 50' are disengaged from wings 40 and 40' thereby enabling side plates 29 to be biased outwardly in a manner heretofore described. Clasp 67 can then be released and machine 60 can be opened in an operable manner and nails loaded into the rear half of the machine comprising casing 61 whereafter machine 60 can again be closed and pusher bar 30' be released and moved forward in the magazine by spring means as described. Pusher bar 30' is retained in retracted position during loading of the magazine by shoulder 41 of bar 30' being brought into operable engagement with forward extremity of slot 42 (FIGURE 1) by lifting handle 31 on pusher bar 30'. Upon the release of pusher bar 30' by depressing handle 31 shoulder 41 clears slot 42 and enables pusher bar 30' to be biased forward in the magazine. The foremost extremity of shaft 36 contacts inclined member 52 thereby being depressed and causing triangular members 50 and 50' to be disposed in a coincident plane with wings 40

6

and 40' of side plates 29. Nailing machine 60 is then operated in a manner identical to that described for nailing machine 10.

In FIGURES 8 and 9 is shown the nail-driving mechanism of nailing machine 60 wherein plunger 88 is of arcuate configuration and is shown in retracted and extended position respectively. Plunger housing 89 and guide rod 94 are similarly of arcuate configuration. Nail guide portion 103 of plunger 88 is straight so as to receive and vertically guide nails into the work surface. Resilient pad 102 is provided at the lower extremity of plunger 88 and plunger 88 is enabled to move reciprocally within plunger casing 89 against compression spring 95 disposed within springwell 96 thereof. Flange 92 provided at the upper extremity of plunger 88 is enabled to move reciprocally within counter bore 91 of casing 89. Cap 93 is provided on casing 89 and guide rod 94 is fixedly attached to cap 93 and extends through spring 95. Shoulder 100 is provided in plunger 88 aligned with and immediately above magnet 101 for engaging the head of the foremost nail in the center file in the magazine and causing it to be transferred past driving head 98 in the manner described heretofore. Compression spring 97 is provided to bias driving head 98 against the plunger 88, with guide pins 99 provided on driving head 98. Hinge 66 is provided immediately adjacent driving head 98 with compression spring 97 abutting and the post of clasp 67 being disposed in the after portion of machine 60. Machine 60 may be opened with the magazine portion being integral with handle 68 in operable manner.

For convenience in manufacture plunger 80 may be of substantially square horizontal cross-sectional configuration or it may be of any other conveniently manufactured configuration. The positioning keyway recess 80 in the plunger member and corresponding stud or key 104 may be eliminated from the device if the plunger configuration is other than round.

In FIGURE 10 another embodiment of the invention is shown wherein curvilinear plunger 62 similar to that shown in FIGURES 8 and 9 is provided. Compression spring 24 affixed to casing 63 bears against plunger 62 as shown with space 25 provided forward of plunger 62 to enable plunger 62 to be displaced against spring 24 when work is being nailed. This embodiment makes possible the operation of the machine with relatively greater ease while preventing such movement of the machine as may result in dragging plunger 62 across the work thereby preventing a nail from being securely driven in proper manner. In the device of FIGURE 10 flange 28, spring 22, guide rod 21, guide rod bore 23, counter bore 27, magnet 69 and shoulder 68 are configured similarly to corresponding members illustrated in FIGURES 8 and 9. Counter bore 27 is preferably rectangular in configuration and does not have a lower terminal edge adjacent the front of plunger 62, but rather tapers into opening 25 wherein spring 24 is disposed. Spring 24 maintains plunger 62 in contacting relation with driving head 85 except when the operator draws the machine across work being nailed, whereupon plunger 62 is enabled to compress spring 24 and move forwardly in the machine without adverse effect. A nail may then be driven home without being bent by rearward movement of plunger 62 on the work surface. Driving head 85, guide pins 86, compression spring 84, hinge 66 and clasp 67 are substantially identical to members described for the machine of FIGURES 7 and 8.

While certain modifications and embodiments of the invention have been described, it is of course to be understood that there are a great number of variations which will suggest themselves to anyone familiar with the subject matter thereof and it is to be distinctly understood that this invention should not be limited except by such

limitations as are clearly imposed in the appended claims.

I claim:

1. A nailing machine comprising in combination a body portion and a head portion fixedly attached thereto, said body portion having a handle adapted to be grasped by one hand of an operator, a magazine for containing a plurality of nails, and a driving head, said head portion comprising a nail positioning means and a bore, said nail positioning means being reciprocally movable in said bore, said nail positioning means being spring loaded to depend beyond said bore and being recessed for a portion of the length thereof for receiving nails longitudinally in said recess, a magnet embedded in said nail positioning means adjacent to said recessed portion thereof, said driving head being movable by spring loading into sliding contact therewith by a nail being moved between said driving head and said nail positioning means and disposed immediately below a foremost nail in said nail magazine by movement of said nail positioning means, said foremost nail being disposed in contact with said nail positioning means in said bore, said nailing machine being operably usable by striking said nail positioning means onto a surface to be nailed thereby driving said nail positioning means upwardly into said bore, causing said driving head to contact the head of a nail magnetically held to said nail positioning means and to drive home said nail into said material to be nailed, said foremost nail in said nail magazine being transferred into position to be driven, by movement of said nail positioning means downward as occurs by said spring loading when said device is withdrawn from said material to be nailed.

2. A nailing machine of the type described adapted to be hand swung in the manner of a hammer and comprising in combination a handle, a nail magazine, a nail feed mechanism, a plunger, a plunger casing and a driving head, said handle being aligned substantially coaxially with said nail magazine and nail feed mechanism, said nail feed mechanism consisting of a spring pressed planar member disposed to feed nails longitudinally through said nail magazine and against said plunger, said plunger having a recess adapted to receive individual nails from said nail magazine, said plunger being slidably movable in said plunger casing and spring loaded to depend be-

yond said plunger casing, said individual nails in said recess being adapted to be transferred by movement of said plunger to a position below said driving head, said driving head disposed to be slidably moved out of contact with said plunger member by movement of a nail therepast, said nailing machine adapted to be swung against the work surface to be nailed so as to cause said plunger to be retracted into said plunger casing against its spring loading and said nail to be driven home by said driving head means.

3. A device as in claim 2 wherein said means for biasing files of nails comprises a shaft slidably affixed to said planar member and adapted to be moved longitudinally therewith, two symmetrical triangular members of unequal size affixed to said shaft and extending transversely from said shaft within said magazine, a pair of vertical side plates movably mounted within said magazine, one of said triangular members first contacting one of said side plates and displacing it inwardly within said nail magazine, and then the other of said triangular members contacting the other of said side plates and displacing it inwardly within said nail magazine, said operations being alternately repeated after a file of nails is transferred from said magazine by said planar member until said nails are exhausted from said nail magazine.

4. A device as in claim 2 wherein said plunger member has a keyway recessed thereinto in which a projection on said plunger casing is disposed.

5. The device of claim 2 wherein said plunger member and plunger casing have an arcuate center line.

6. The device of claim 2 wherein said driving head is disposed to move substantially parallel to the axis of said nail magazine, said driving head being abutable against said plunger, an end extremity of said driving head being in contact with said plunger and being bevelled to enable a nail to be forced between said plunger and said driving head to displace said driving head from contact with said plunger member, said driving head being returned into contact with said plunger by spring means when said nail has passed therebetween.

No references cited.

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