

[54] **TOOL ATTACHMENT AND METHOD FOR AUTOMATICALLY APPLYING FASTENERS**

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[51] Int. Cl.**B25c 1/04**

[58] Field of Search.....227/109, 120, 123, 134, 136, 227/140, 147, 148, 127

References Cited

UNITED STATES PATENTS

2,199,833	5/1940	Fleischman.....227/148 X
2,585,942	2/1952	Juilfs.....227/134 X
2,994,878	8/1961	Abrahamsen.....227/120 X

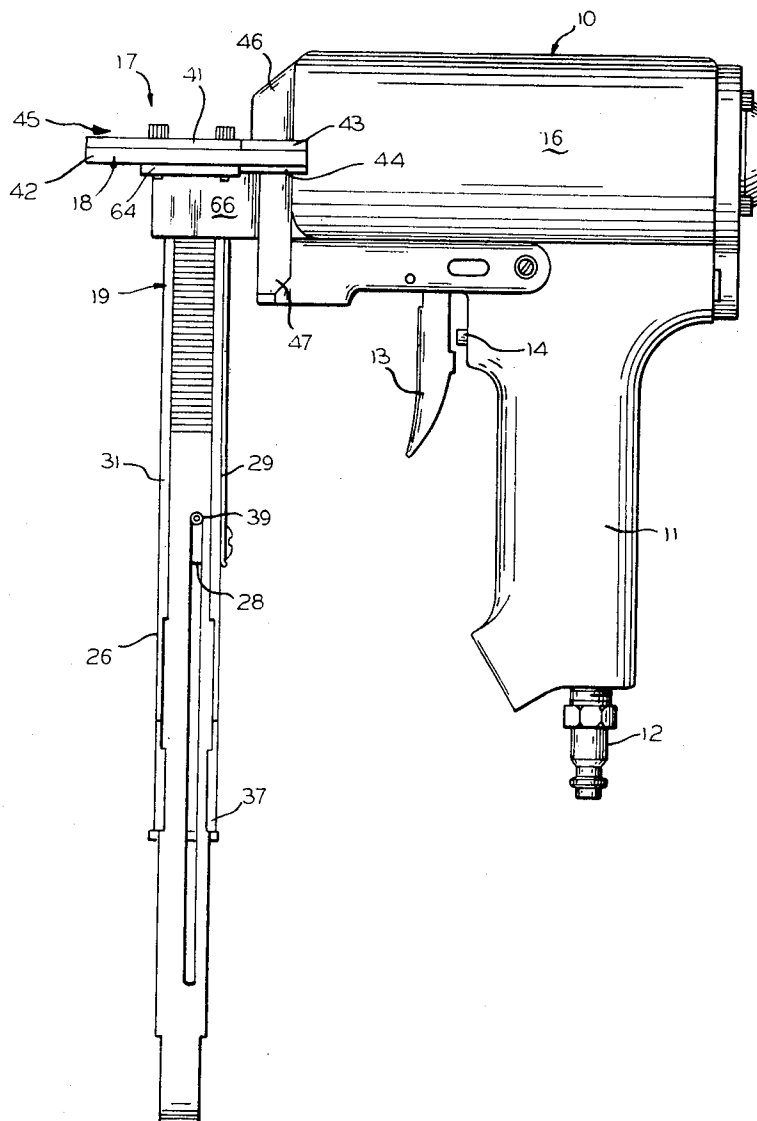
3,272,417	9/1966	Howard et al.227/123
3,301,456	1/1967	Schafroth et al.227/120
3,469,758	9/1969	Volkman.....227/120
3,232,511	2/1966	Crooks227/136 X
3,563,438	2/1971	Doyle227/136 X

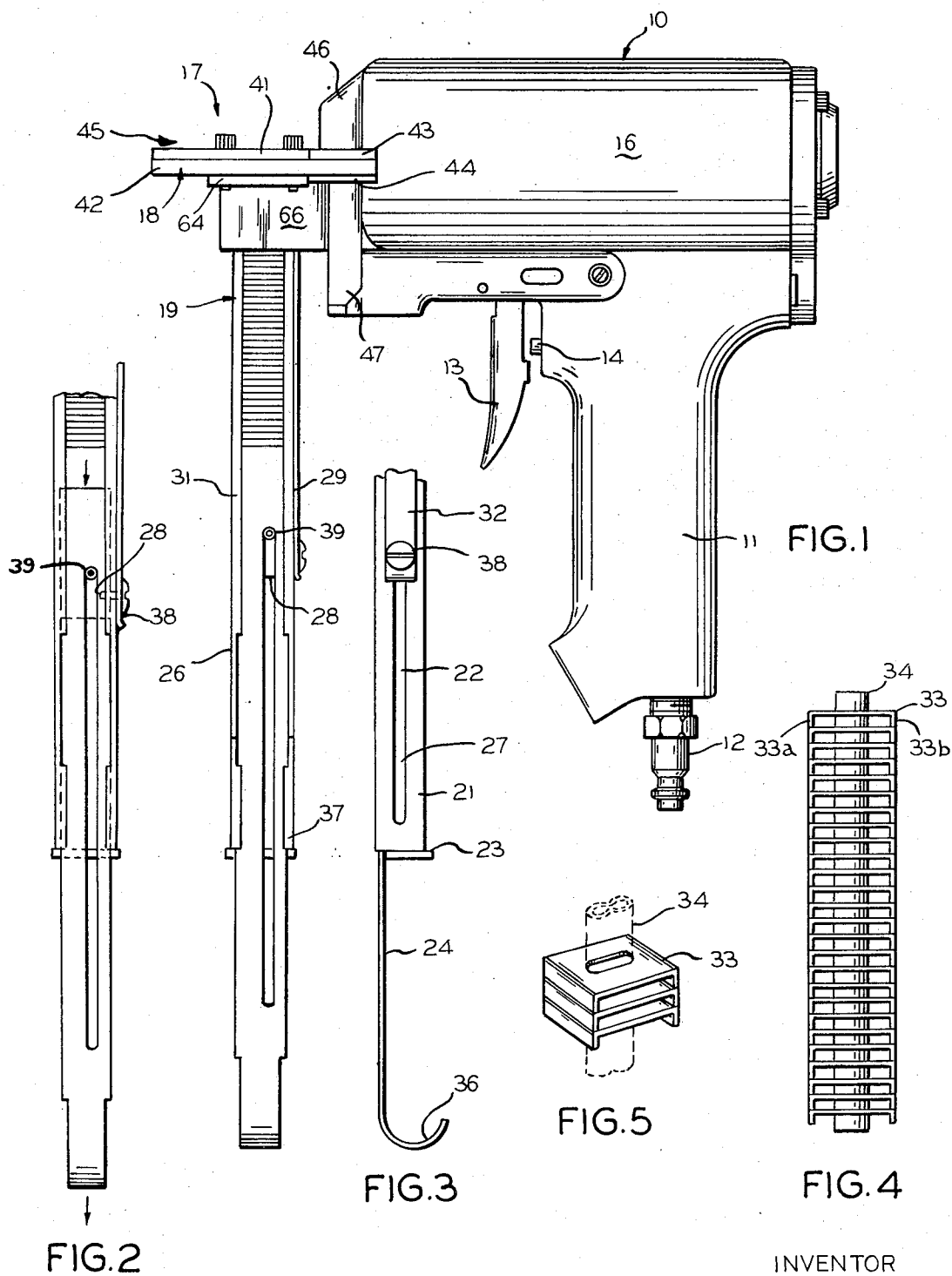
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[57] **ABSTRACT**

An attachment arrangement for use with driving tools, such as air guns, or the like. The attachment facilitates driving a series of separate fasteners that are held on a carrier to fasten contiguous pieces of wood together. The attachment arrangement includes a characterized nose structure having an aperture therethrough to enable the carrier to pass through the nose structure and permit the automatic application of the separate fasteners in the fabrication of furniture, or the like.

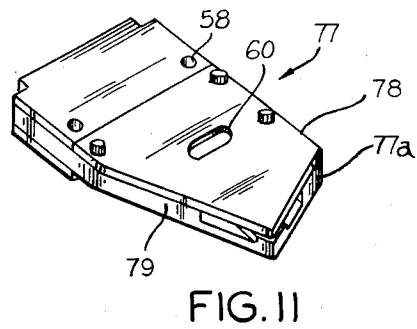
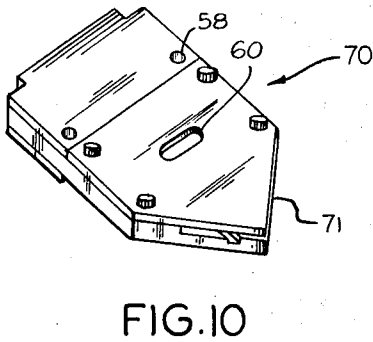
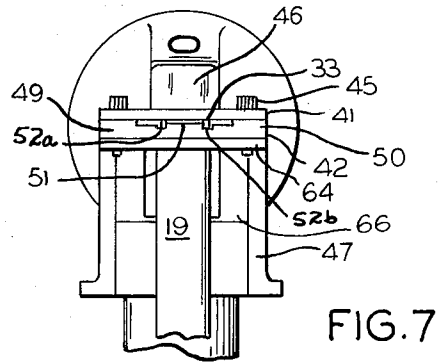
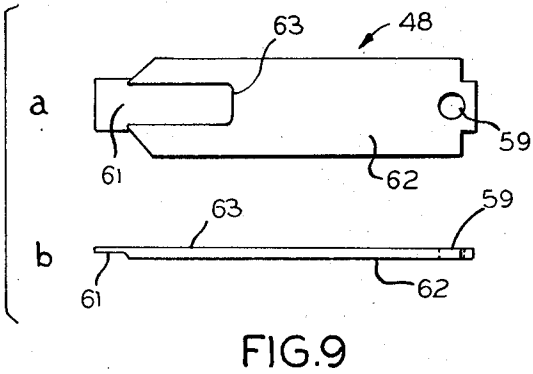
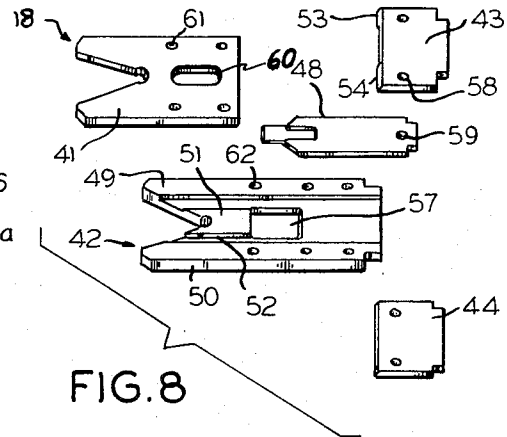
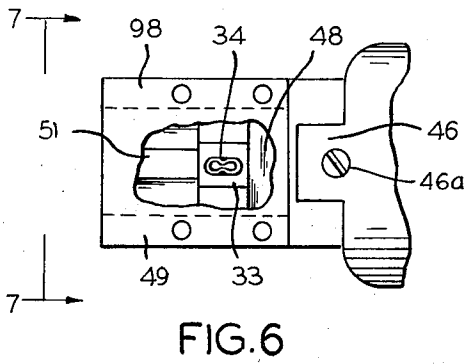
11 Claims, 18 Drawing Figures





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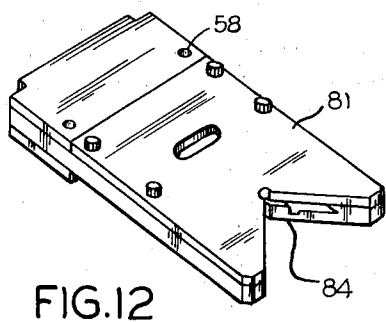


FIG. 12

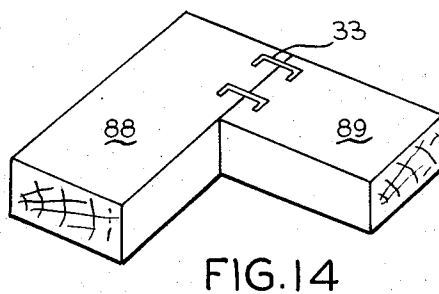


FIG. 14

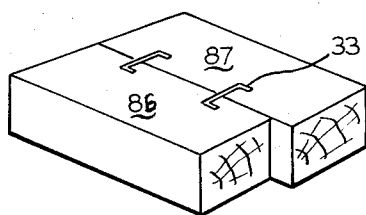


FIG. 13

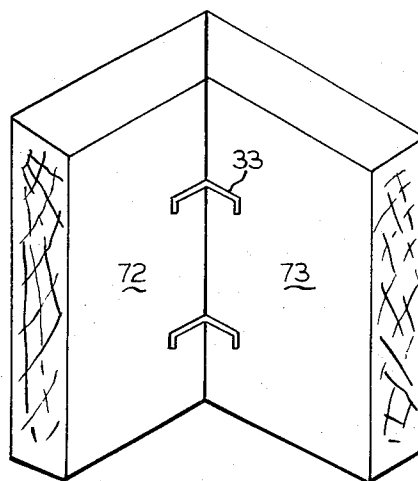


FIG. 16

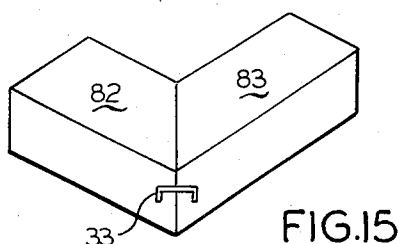


FIG. 15

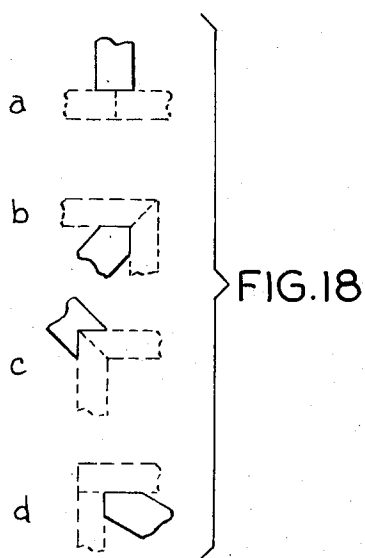


FIG. 18

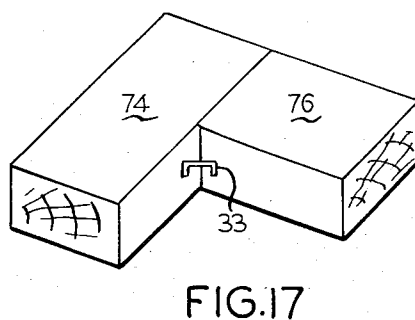


FIG. 17

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TOOL ATTACHMENT AND METHOD FOR AUTOMATICALLY APPLYING FASTENERS

This application relates to tool attachments for use with driving tools and more particularly to tool attachments for use in conjunction with the improved fasteners described in my application for Letters Patent entitled, "Wood Fasteners," filed Sept. 3, 1968, bearing Serial No. 756,844 which issued as U.S. Pat. No. 3,618,446 on Nov. 9, 1971.

Many types of fasteners have been devised for furniture fabrication or for cabinetry wherein the final products is made of either wood, plastic or the like. One difficulty with these various types of fasteners has been in automating the use of the fasteners.

The most readily thought of example of automatic fastener equipment, of course, is the stapler, wherein a plurality of fasteners are held in a magazine gun type device and easily dispensed in the fastening position to perform its fastening function. The stapler is practical because the staples themselves come joined together in strips so that there is no problem loading them into the magazine. The problem of using the automatic gun type of device is made unduly complicated when the fastener used is not inherently joined together in strips in the production of the fastener.

I have overcome the difficulty of using my wood fasteners in an automatic gun type device by providing an fastener guide means for use with an air gun or the like in automatically driving fasteners of the type described in the above noted application for Letters Patent.

Accordingly, it is an object of this invention to provide an fastener guide means for use with an automatic driving device to enable the automatic application of fasteners.

A still further object of this invention is to provide a variety of nose structures as part of the fastener guide means for use in applying fasteners to different types of joints of material such as wood, plywood or particle board. Thus, a nose structure is provided for use where the fasteners are to be driven into flat surfaces such as mitre or butt joints; for use where the fasteners are to be utilized on inside mitre joints, such as on the inside of a box or a picture frame; for use on the outside of a butt joints such as shelves, corner boxes, and legs or stringers.

In accordance with one aspect of the invention, an fastener guide means arrangement is provided comprising a nose structure attached to an automatic driver wherein the drive piston fits into one end of the nose structure. Magazine means are disposed from the nose structure to hold the fasteners being used and to feed the fasteners into position in the nose structure sequentially to be driven into the joints of the furniture, or the like being assembled. The magazine includes carrier rod means for carrying a series of the fasteners in a manner enabling their movement and consequent positioning on a one at a time basis without nesting.

The foregoing and other objects and advantages of this invention and the manner of obtaining them will become more apparent and the invention itself will be best understood by reference of the following description of embodiments of the the invention taken in conjunction with the accompanying drawings, wherein:

FIG. 1 is a side view of an automatic drive tool such as an air gun having the fastener guide means thereon;

FIG. 2 is a side view of the magazine portion of the fastener guide means showing the follower slightly removed from the fasteners;

FIG. 3 is a rear view of the magazine showing the attachment of spring means to the follower;

FIG. 4 is a rear view of the fastener carrier having a series of fasteners mounted thereon;

FIG. 5 is a pictorial view of the carrier of FIG. 4 to more clearly show the preferred shape of the carrier;

FIG. 6 is a view taken along the lines 6—6 in FIG. 1 looking in a direction of the arrows with the cover plate of the nose structure of the fastener guide means partially broken away;

FIG. 7 is a view of the nose structure mounted in the gun taken along the line 7—7 of FIG. 6 looking in the direction of the arrows;

FIG. 8 is a pictorial exploded showing of one of the nose structures used in the fastener guide means;

FIGS. 9a and 9b are the top and side views of the driver nose structure used with the fastener guide means;

FIG. 10 is a pictorial showing of a second type of nose structure used in the fastener guide means;

FIG. 11 is a pictorial showing of the third type of nose structure used in the fastener guide means;

FIG. 12 is a pictorial showing of a fourth type of nose structure used in the inventive fastener guide means;

FIG. 13 shows two pieces of wood or the like, joined together in contiguous side by side relationship and held by the inventive fasteners as applied automatically using the inventive fastener guide means;

FIG. 14 shows another two pieces of wood or the like, in a butted corner joint held together by the inventive fasteners applied to the flat of the joint;

FIG. 15 shown two pieces of wood, or the like, joined at a mitre joint held together with the inventive fasteners, applied at the outer apex of the joint;

FIG. 16 shows two flat pieces of wood or the like, joined at mitre joint, and held together with an inventive fastener applied at the inner apex of the joint;

FIG. 17 shows two pieces of wood or the like joined at a butt joint and held together with a fastener at the inside of the joint; and

FIGS. 18 (a-d) schematically shows the application of the different type of nose structures to the various kinds of joints.

Similar characters of reference indicate corresponding parts throughout the various view. Referring now to the same, the automatic driving mechanism is shown in FIG. 1 as an air gun 10. The gun 10 is comprised of a handle section 11 having a coupling attachment 12 for coupling an air hose thereto. Adjacent to the handle section is a trigger 13 which, when depressed in turn pushes against a plunger 14 to operate a valve (not shown) which actuates the driver (not shown) in the drive piston portion 16 of the air gun.

The fastener guide means 17 is shown attached to the air gun 10. The fastener guide means comprises nose structure mean for selectively directing the fasteners into the pieces being joined together. Means are provided for storing the fasteners in a dispensible condition such as magazine means 19 which is disposed from the nose structure means. The magazine further operates in combination with the nose structure and gun for dispensing the fasteners on a one at a time sequential basis.

More particularly, magazine 19 comprises a back wall 21 having a slot 22 therein. The back wall terminates in a bottom flange 23. The bottom portion of flange 23 is set off to one side to enable a follower controller 24 to extend downwardly below the bottom flange 23. The magazine 19 is further defined by front wall 26 and by a side wall 27 visible through slot 22.

Means are provided for forcing the fasteners toward the nozzle. More particularly, a follower 28 is fastened to the upper portion of the control 24. The follower 28 is shown as comprising a solid piece of material slidably contained between the three walls of the magazine. The front and rear walls 26 and 21, respectively, of the magazine have side flanges 31 and 29, respectively which extend over the normally opened side of the magazine as best seen in FIG. 1. The flange portion enables the follower control 24 to slide within the confined enclosure of the magazine against the flanges 29 and 31.

Means such as spring 32 are provided for continuously exerting a force on the fasteners such as fasteners 33 through follower 28 to force the fastener into the nozzle.

The fasteners, such as fastener 33 are mounted on a carrier 34. To load the magazine, control 24 which has a bottom hook portion 36 is pulled down to the point where the follower 28 rests against the bottom flange 23. The flanges 29 and 31 terminate a fixed distance above bottom flange 23 to provide an expanded opening 37. The expanded opening 37 at the bottom of the magazine 19 is sufficient large to enable placing carrier 34 loaded with fasteners 33 into the confined enclosure of the magazine above the follower 28. It should be understood that the carrier 34 is flexible which makes the loading possible without having the opening 37 extraordinarily large. The follower upon being released is forced upward against the bottom of the carrier 34 by spring 32. Spring 32 may be connected to the follower 28 in any well known manner such as through the use of threaded fasteners 38. Similarly, control 24 is also connected to the follower 28 in any well known manner such as through the use of pin arrangement 39. The follower 28 forces the carrier 34 upward until it abuts against the cover plate 41 of nose structure 18.

The nose structure 18 comprises a cover plate 41 which rests on a guide plate 42 that is sandwiched between a top plate 43 and a bottom plate 44. The plates of the nozzle are held together through the use of any well known fasteners such as threaded fasteners 45 which pass through apertures in the cover plate and thread into threaded holes in the guide plate 42.

As best seen in FIG. 5, a preferred embodiment of the carrier 34 is shaped to resemble a FIG. 8. It has been found that with this shape there is less likelihood of the fasteners nesting while they are being placed on the carrier. The carrier 34 further is made of a thermoplastic material such as the well known polypropylene used as the basic material of many tubes.

The nose structure 18 is retained within the piston portion of the gun in any well known manner. For example protrusions 46, 47 are provided having a slot therein which is designed to receive the nose structure 18 and the nose structure is retained therein in any well known manner, such as through the use of clamp

screws 46a which tightens against top plate 43. The nose structure 18 when in place on the piston portion of the gun is aligned to receive the driver of the gun. Also fasteners not shown may pass through apertures 58 of top plate 43 and apertures of the guide plate and bottom plates aligned therewith to thread into threaded holes (not shown) in portion 47 of the gun. A portion of the driver 48 is shown in FIG. 6 and the complete driver is shown in the exploded view of FIG. 8 and in FIG. 9.

In FIG. 1 it is seen that the rear of cover plate 41 abuts the front of top plate 43. The guide plate 42 comprises a pair of raised peripheral ledges 49, 50 at each side thereof. Also, a raised guide portion 51 is provided. The dimensions of the raised guide portion 51 are such that the fastener 33 slidably fits thereover with the downward extending edges 33a, 33b of the fastener fitting over the ledge 51, reaching into grooved slots 52a, 52b located on either side of raised guide portion 51 on guide plate 42. The top plate 43 may have raised ledges 53, 54 conforming to raised ledges 49, 50 of the guide plate 42, respectively. The important aspect is that the top plate in conjunction with guide plate forms a passageway for the driver 48.

Normally, the driver rests between the top plate and the guide plate. Means are provided in the guide plate such as aperture 57 through which the carrier 34 and fasteners 33 can project with the surfaces abutting cover plate 41 thus positioning the fastener 33 into the line of travel of the reciprocating driver. The reciprocating driver moves to the front of the nozzle within the groove defined by the ledges 49, 50 to abut with fasteners 33 and force the fasteners 33 onto the raised guide portion 51 at the same time breaking or cutting the carrier tube 34 against the edge of the guide plate aperture. When the drive plate is withdrawn, the topmost fastener on carrier 34 is once again forced to abut cover plate 41 thereby aligning the next fastener 33 for operation thereon by driver 48. The carrier extends through hole 60 positioned to be sheared by the periphery of the aperture in the guide plate when the unsheared portion of the carrier extends through hole 60 the previously sheared portion is forced out. If the gun is in a position whereby the hole 60 is not on a horizontal plane then the previously sheared portion will fall out because of the force of gravity prior to being forced out.

The top plate and bottom plate 43, 44 are respectively held contiguous to guide plate and are used for fastening the nozzle to gun 10. The guide plate and top and bottom plates are held together with any well known fasteners, such as pins or rivets (not shown) driven through the apertures 58 in the guide plate and top and bottom plates.

Means including aperture 59, for example are provided for attaching the driver to the drive piston of the gun. The driver is preferably fabricated from spring steel. A typical example of a driver is shown in FIG. 9. It comprises lead section 61 shown protruding from the main body section 62. The lead section 61 engages the fasteners 33 to force them from the nozzle into the material being assembled. The rear thickness of the drive plate substantially fills the space defined by the cover plate and the guide plate between the peripheral ledges 49, 50. The leading edge 61 fits over the raised

guide portion 51. A grooved section 63 conforms to guide portion 51 and enables the driver to clear the raised guide portion 51 while the fastener is being forced from the nose structure. The sheared portion of 34 is subsequently dropped through aperture 57 to abut the top of carrier 34 when the driver 48 is to its location at the rear of the nose structure. An aperture, such as aperture 60 is provided in the top plate to enable the sheared portion 34 to escape when the carrier is forced through aperture 60. Aperture 60 is large enough for carrier 34 to pass therethrough but not large enough for fastener 33 to pass therethrough. The magazine then forces the carrier in the aperture 57 in guide plate to extend through hole 60 with the fastener abutting against cover plate 41.

Means, such as an attachment plate 64 which may be an integral part of the magazine is used to couple the magazine to the nose structure. Similarly, a gun connecting plate 66 which may be an integral part of the gun may also be used in conjunction with the nose structure connecting plate 64 to reliably hold the magazine in position. It should be understood that many methods of attaching the nozzle and fastener guide means that are well known to those skilled in the art can be used without changing the invention described herein.

FIGS. 10-12 show variations of the straight nose structure shown and described heretofore. For example, the nose structure of FIG. 10 is adapted for use in coupling together mitred sections such as that shown in FIG. 16 wherein the fastener is placed on the inside corner of the mitred sections 71, 72. This application is shown schematically in FIG. 18 (b).

Similarly, the application of the nose structure of FIG. 11 to effect the joinder of wood pieces of FIG. 17 is shown schematically in FIG. 18d. This type of nose structure is especially useful in assembling shelves to risers or where frames are assembled to stringers.

As is shown, the nose structure 70 of FIG. 10 is distinguishable by its symmetrically pointed front section 71. FIG. 11 shows the nose structure used for forming butted joints wherein the two pieces being joined are not biased and the fastener is to be placed on the inside inner corner formed by the two blocks of material. This type of joint as shown in FIG. 17 joins pieces 74, 76.

The nose structure 77 of FIG. 11 is characterized by its offset angular front portion. More particularly, one front side 77a is biased from the side 78 at a relatively large angle to the side and forming a relatively short front side. The other biased front side 79 is biased at a relatively small angle from the side, and therefore forms a long side. It has been found that if the nose structure 70 is used to join the pieces 74 and 76 to effect a joint such as shown in FIG. 17, then the fastener 33 will be offset so that the main portion of fastener 33 engages on a small portion of piece 76. Thus, the most efficient and strongest joint is not effected when using a nose structure 70 on the inside corner of FIG. 17, but the most efficient and strongest joint is obtained when using nose structure 77 as shown in FIG. 18d for effecting the joint of FIG. 17.

Nose structure 81 shown in FIG. 12 is best suited for placing fasteners at the outside of the biased corner as shown in FIG. 15. The application of nose structure 81 is schematically shown in FIG. 18c. The assembled

biased corner as shown in FIG. 15 is made up of pieces 82, and 83.

Nose structure 81 is characterized by the triangular notch 84 at the front of the nose structure 81.

The nose structure 43 previously discussed is best suited for joining the separate pieces of wood or plastic material together in joints such as shown in FIG. 13 and FIG. 14 whereby pieces 86, 87, 88, 89 are respectively joined together by the fasteners, such as fastener 33 using the nose structure 43 in the manner schematically shown in FIG. 18a.

Thus, to use applicant's fastener guide means, a set of nose structures is provided comprising nose structures 43, 70, 77 and 81. With the set of nose structures, any type of joint, such as those shown in FIG. 18 can be effected. The appropriate nose structure is selected and attached to the automatic driving mechanism such as air gun 10. The magazine is then attached to the nose structure and the carrier 34 with fasteners 33 thereon is loaded into the magazine. To load the carrier into the magazine, the press control handle 36 is pulled down and the carrier and fasteners are placed through notch 37. The control handle 36 is released and spring 32 forces the follower 28 up against the bottom of the fasteners carrier causing the top of the carrier to pass through aperture 60 and fasteners thereon to abut against cover plate 41 of the nose structure.

When trigger 13 is actuated, it causes the plunger 14 to be pushed in to operate a valve that causes a drive piston to reciprocatingly move. The driver 18 attached thereto is forced into reciprocating motion within the grooves of the guide plate to push the top most fastener onto upstanding fastener guide ledge 51 and at the same time shear the top of the carrier. The driver continues to push the fastener along the ledge until it is forced into the two pieces of wood or other material being assembled. The force of the drive will cause the fastener to be buried in the two pieces of wood. The driver then is automatically pulled back in the well known manner of the air gun. As the drive is pulled back, the sliced off portion of the carrier escapes through aperture 60 either because of the force of gravity or when forced by the unshaped portion of the carrier.

The spring 32 automatically forces follower 28 to force the new top most section of carrier 34 through aperture 60 and the topmost fastener against the cover plate, thus aligning the topmost fastener 33 into position to be driven into the pieces of wood by driver 48. This operation is continued until all pieces desired to be fastened together are so fastened together. The operator may change nose structures if a more suitable one is required to assemble different shaped joints for different types of furniture arrangements, or the like.

Although I have shown a specific construction and arrangement of the parts and features, I am fully cognizant of the fact that many changes may be made in the parts and features without effecting their operativeness, and I reserve the rights to make such changes as I may deem necessary or convenient, without departing from the spirit of my invention.

Having thus described my invention, what I claim and desire to secure by Letters Patent in the United States, is:

1. An attachment arrangement for use with fastener driving guns to automatically drive a series of separate fasteners mounted on a carrier into two parts to be fastened together contiguously,
 said arrangement comprising a nose structure having a drive channel attached to the drive portion of the gun for guiding the fasteners driven by said gun into said parts,
 magazine means for storing said fasteners and for automatically feeding the fasteners into the nose structure on a one at a time basis,
 means in said magazine for applying a force directly to the carrier to move the carrier and cause the foremost fastener on said carrier to be placed within said drive channel, and
 said nose structure having an aperture of a size to receive said carrier to enable the carrier to pass through the nose structure but to retain the fasteners in the drive channel.

2. An attachment arrangement for use with fastener driving guns to automatically drive a series of fasteners into two parts to be fastened together contiguously, said fasteners comprising converging peripheral resilient side walls, said side walls extending downward from a body section, said body section including an elongated hole therein,
 said attachment comprising a nose structure having a drive channel attached to the drive portion of the gun for guiding the fasteners driven by the gun into said parts, and
 said nose structure having chamfered outer faces adapted to be placed in abutting relation with the parts to be fastened together,
 said drive channel opening into the juncture between said parts, whereby said side walls will enter the parts with the body section bridging the juncture.

3. The applique of claim 1 wherein said means for forcing said carrier means comprises spring means acting on the bottom of said carrier means.

4. The attachment arrangement of claim 3 wherein said magazine means includes a walled compartment for receiving and holding said carrier means, follower means dimensioned to slide within said walled compartment,
 means for affixing one end of said spring means to said follower means to thereby apply the spring force to said follower means,
 handle means attached to said follower means for moving said follower means within the walls of said compartment to enable placing the carrier means within the compartment, and
 said follower means being forced against the bottom of said carrier means when said handle is released to force the top of said means through said nose structure and the associated fastener thereon into said drive channel.

5. The attachment arrangement of claim 1 wherein said nose structure comprises:
 means at the back portion of said nose structure for attaching said nose structure to said gun,
 means for driving the fastener placed within said drive channel into the parts to be fastened together, and
 means to properly position the foremost fastener into alignment with said means for driving the fastener whereby the fastener can be driven from said drive channel.

6. The attachment arrangement of claim 5 wherein said drive channel comprises a guide plate means, said guide plate means comprising means conforming to the shape of said fastener at the front portion of said guide plate means whereby said guide plate means guides said fastener as it is driven from said nose structure,
 said nose structure further comprising a cover plate for fitting above said guide plate and stopping said foremost fastener to position the foremost fastener juxtaposed to said conformed portion of said nose structure.

7. The attachment arrangement of claim 6 wherein said nose structure includes a
 driver attached to the drive portion of the gun,
 said driver comprising a front portion shaped to fit between said cover plate and said conformed portion of said guide plate and to extend at least to the front most section of said guide plate, whereby, when said driver is forced forward by said gun, said fastener is driven completely from said nose structure and is buried in both of said parts being fastened together.

8. The attachment arrangement of claim 2 wherein said nose structure comprises a "V"-notched front portion whereby said nose structure can be used to apply the fasteners to the external vertex of a mitre joint.

9. The attachment arrangement of claim 2 wherein said nose structure comprises a V-shaped front portion whereby said nose structure can be used to apply the fasteners to the inner vertex of a mitre joint.

10. The attachment arrangement of claim 2 wherein said nose structure has a flat front portion whereby said nose structure can be used to apply the fasteners into abutting flat parts.

11. The attachment arrangement of claim 2 wherein said nose structure comprises a characterized angled front portion wherein the front angles are non-symmetrical, one angled front side depending from the side contiguous thereto at a greater angle than the other angled front side whereby said nose structure can be used to apply the fasteners into the inner vertex of a right angle joint so that the fastener is driven equally into both parts being contiguously joined.

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