



(43) International Publication Date
15 November 2012 (15.11.2012)

- (51) International Patent Classification:
B65C 1/04 (2006.01) *B25F 5/02* (2006.01)
- (21) International Application Number:
PCT/US2012/037039
- (22) International Filing Date:
9 May 2012 (09.05.2012)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
13/104,709 10 May 2011 (10.05.2011) US
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(81) Designated States (unless otherwise indicated, for every
kind of national protection available): AE, AG, AL, AM,
AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ,
CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO,
DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN,
HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR,
KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME,
MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ,
OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD,
SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR,
TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every
kind of regional protection available): ARIPO (BW, GH,
GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ,
UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ,
TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK,
EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV,
MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM,

[Continued on next page]

(54) Title: REINFORCED PLASTIC SLEEVE FOR PNEUMATIC NAILER

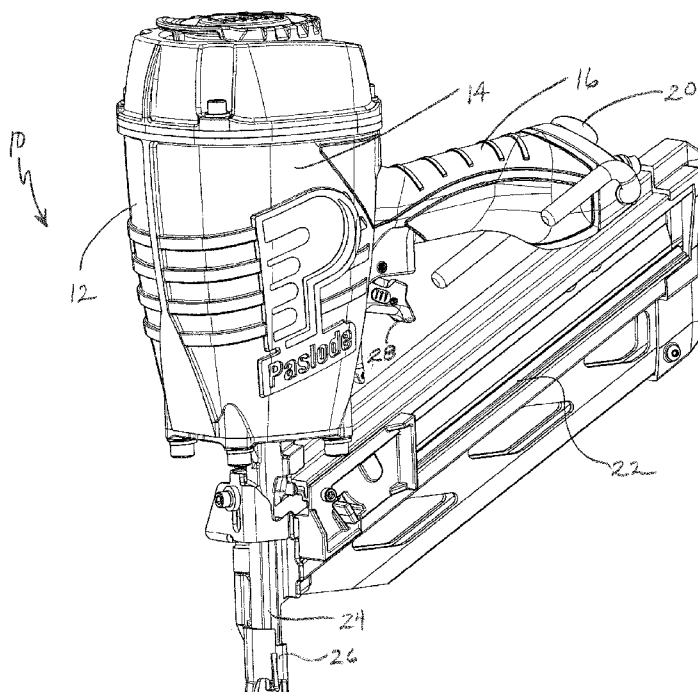


FIGURE 1

(57) Abstract: A sleeve for a pneumatic
nailer is provided that includes a cyl-
indrical tubular body made of plastic
and having a lower edge; and a metal
reinforcing ring is integrally secured to
the lower edge.



TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG). **Published:**

— *with international search report (Art. 21(3))*

Declarations under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

REINFORCED PLASTIC SLEEVE FOR
PNEUMATIC NAILER

BACKGROUND

The present invention relates to fastener driving tools, and more particularly to pneumatically powered fastener drivers, also referred to as pneumatic nailers.

5 In conventional pneumatic nailers, such as those disclosed in US Patent No. 3,638,532; 6,604,664 and pending application serial no. 13/037,872 incorporated by reference, the nailer is pressed down upon a workpiece needing a fastener, and in so doing, a workpiece contact element (WCE) is retracted relative to the tool housing. User depression of a trigger
10 activates a trigger valve, which directs pneumatic pressure within the tool such that a piston is driven down a sleeve or cylinder to impact and drive a fastener into the workpiece.

 Pneumatic nailers have traditionally been equipped with sleeves or cylinders made of metal, such as cast aluminum or the like. Due to a
15 motivation for reducing cost and weight for such tools, sleeves made of plastic have been used with some success in relatively smaller pneumatic nailers such as trim tools and staplers. Such sleeves are preferably made by injection molding. These tools generate relatively less energy than that generated in a relatively larger framing tool. Due to the increased operational stresses and

power generated by framing tools, plastic sleeves have not previously been suitable, and have failed when applied to such stools. However, there is still a desire by manufacturers to provide pneumatic framing tools with the advantages of reduced cost and weight obtained by smaller tools in converting
5 to plastic sleeves.

SUMMARY

The above-listed drawback is addressed by the present plastic sleeve, which is suitable for use in a pneumatic framing tool. By adding a
10 metal reinforcing ring, the present sleeve offers the durability of a metal sleeve, with the weight and cost savings of a plastic sleeve. The metal reinforcing ring prevents the premature flexing and cracking which resulted in premature failure experienced by completely plastic sleeves when used in pneumatic framing tools. An important feature of the present sleeve is that the metal ring is
15 integrally bonded to the plastic sleeve to provide a unitary component.

Another feature of the present sleeve is that the reinforcing ring has solid walls and is secured to the plastic sleeve below the vent openings conventionally provided to such sleeves for venting the air forced down the sleeve through the action of the piston during a power stroke. Flexing at these
20 openings has previously caused failure in plastic sleeves used in pneumatic framing nailers. In addition, the plastic of the present sleeve has been selected to have a greater glass-filled content and to thus be less prone to expand due to

hygroscopic moisture growth, and accordingly is stronger than prior art plastic sleeves.

More specifically, a sleeve for a pneumatic nailer is provided that includes a cylindrical tubular body made of plastic and having a lower edge;
5 and a metal reinforcing ring is integrally secured to the lower edge.

In another embodiment, a sleeve for a pneumatic nailer is provided, including a cylindrical tubular body made of plastic, having a lower edge and a plurality of vent openings adjacent the lower edge, and a metal reinforcing ring integrally secured to the lower edge, the ring having an upper
10 margin located below the openings for reinforcing the body against flexing.

In still another embodiment, a pneumatic framing nailer is provided, including a housing enclosing a power source and having a handle, a nosepiece depending from the housing, and a magazine connected to the nosepiece and configured for sequentially delivering fasteners. The power
15 source includes a sleeve defining a pathway for a reciprocating piston and driver blade, and the sleeve has a cylindrical tubular body made of plastic and has a lower edge, with a metal reinforcing ring integrally secured to the lower edge.

20 BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top perspective view of a pneumatic nailer equipped with the present invention;

FIG. 2 is a side elevation in partial section of the nailer of FIG. 1 showing the present sleeve; and

FIG. 3 is a side elevation of the present sleeve equipped with a reinforcing ring.

5

DETAILED DESCRIPTION

Referring to FIGs. 1 and 2, a fastener driving nailer or tool, generally designated 10, is preferably pneumatically powered, and more preferably is a framing type tool. This designation is well known in the art, and
10 refers to nailers generating sufficient power for driving fasteners at least as long as 1.5 inches into wooden framing studs. Such nailers generate more power than trim tools and staplers. In the present application, orientation terms such as “vertical,” “upper,” “lower,” “rearward,” etc. refer to the tool 10 as depicted in FIGs. 1 and 2.

15 The tool 10 includes a housing 12 including a generally vertically extending portion 14 and a rearward extending handle 16 defining and enclosing a fluid reservoir 18. A pneumatic air connection 20 such as a nipple is located at a rear of the handle 16. A pressurized line from a compressor (not shown) as is known in the art pressurizes the fluid reservoir 18. Also as is
20 known in the art, a magazine 22 feeds fasteners to a tool nose or nosepiece 24 having a workpiece contact element (WCE) 26, the latter reciprocally slidable relative to the nose so that it retracts upon the user pressing the tool 10 against a workpiece prior to driving a fastener. A trigger 28 controls a trigger valve

(not shown). As is the case with conventional pneumatic nailers, in the tool 10 the WCE 26 is mechanically linked to the trigger valve, so that the trigger valve is actuable by movement of the trigger 28 and the WCE concurrently.

Referring now to FIG. 2, the vertically extending housing portion
5 14 encloses a power source 32 including a cylinder or sleeve 34 accommodating a piston 36 to which is attached a depending driver blade 38 for sequentially engaging and driving fasteners provided by the magazine 22. As is known in the art, the driver blade 38 reciprocates within a passage (not shown) in the nose 24 for engaging the fasteners. At a lower end 40 of the
10 sleeve 34 is disposed a resilient bumper 42 which absorbs impact shock of the piston 36 at a lower end of its power cycle, and facilitates the return of the piston to its pre-driving position seen in FIG. 2.

The sleeve 34 has a radially extending flange 44 sealingly connected to a bulkhead 46 for defining a sealed return chamber 48 below the
15 bulkhead, which is sealed from the pressurized reservoir 18, located above the bulkhead. As is well known in the art of pneumatic tools, the reservoir 18 is pressurized by compressed air entering through the nipple connector 20.

Also provided to the sleeve 34 is a plurality of vent openings 50 for venting air pushed down the sleeve in front of, and by the piston 36 as it
20 drives a fastener. Air behind the piston 36 which pushes it down the sleeve 34 for driving the fastener is allowed to escape through a generally horizontally-arranged row of check valve openings 52, which are in communication with the

return chamber 48, providing compressed air to assist the piston 36 back to the pre-driving position at the completion of the fastener driving cycle.

Referring now to FIGs. 2 and 3, a main feature of the present tool 10 is that the sleeve 34 is made of plastic. While plastic sleeves are known in the pneumatic tool art, until the present invention, there has not been a commercial embodiment of a pneumatic framing tool with a plastic sleeve. Applicant has achieved a reliable plastic sleeve for a pneumatic framing nailer by using a metal reinforcing ring 54, combined with the manner of fastening the ring to the sleeve 34, as well as the location of the ring on the sleeve.

More specifically, the present sleeve 34 has a tubular, generally cylindrical body 56 preferably made of a reinforced plastic material such as Celstran® aramid fiber reinforced nylon 6/6 having fibers in the range of 20-60%. Celstran® fiber reinforced nylon is made by Ticona, Auburn Hills, Michigan, and is a preferred form of long fiber-reinforced thermoplastics (LFRT) made by pultrusion so that the fibers are fully impregnated into the plastic for enhanced reinforcement. In the preferred embodiment, the fibers are about 10mm long. The resulting material is relatively strong and is better able to withstand the stresses generated during operation of the present pneumatic framing nailer 10. In addition, this preferred material is resistant to hygroscopic expansion which causes unwanted flexing of the sleeve 34 and in some cases has increased cracking and sleeve failure.

On a lower edge 58 of the sleeve body 56 is disposed the metal reinforcing ring 54. While other materials are contemplated, it is preferred that

the reinforcing ring 54 is made of steel or stainless steel. It is especially preferred that the ring 54 is secured to the sleeve body 56 so that it becomes an integral component of the sleeve. Contemplated attachment techniques include press fitting, insert molding and the like to ensure that the ring 54 is integrally
5 joined to the sleeve 34. The reinforcing ring 54 has an upper margin 60 which is generally aligned with a lower margin 62 of at least one of the vent openings 50. Thus, the reinforcing ring is located below the vent openings 50. Enhanced results have been achieved when the upper ring margin 60 is aligned with the lower margins 62 of all of the vent openings 50. A lower ring margin
10 64 is preferably aligned with the lower edge 58 of the sleeve 34.

It has been found that the combination of a relatively stronger, more stable plastic for forming the sleeve body 56, and the integral formation of the reinforcing ring 54 at the lower edge 58 of the sleeve 34 below the vent openings 50 has provided a sufficiently strong and durable plastic sleeve that is
15 not subject to expansion and cracking previously encountered when such sleeves were placed in pneumatic framing tools. Thus, Applicant has provided a design which enables the advantages of lower weight and cost to be incorporated into pneumatic framing tools.

While a particular embodiment of the present reinforced plastic
20 sleeve for a pneumatic nailer has been described herein, it will be appreciated by those skilled in the art that changes and modifications may be made thereto without departing from the invention in its broader aspects and as set forth in the following claims.

WHAT IS CLAIMED IS:

1. A sleeve for a pneumatic nailer, comprising:
a cylindrical tubular body made of plastic and having a lower
5 edge; and
a metal reinforcing ring integrally secured to said lower edge.
2. The sleeve of claim 1 wherein said body is provided with
at least one vent opening adjacent said lower edge, and said reinforcing ring
10 has an upper margin located below said at least one vent opening.
3. The sleeve of claim 2 wherein said upper margin of said
reinforcing ring is generally aligned with a lower margin of said at least one
vent opening.
15
4. The sleeve of claim 1 wherein said body is made of
Celstran® aramid fiber reinforced nylon 6/6 having fibers in the range of 20-
60%.
- 20 5. The sleeve of claim 1 wherein said reinforcing ring is
made of one of steel and stainless steel.

6. A sleeve for a pneumatic nailer, comprising:
a cylindrical tubular body made of plastic, having a lower edge
and a plurality of vent openings adjacent said lower edge; and
a metal reinforcing ring integrally secured to said lower edge,
5 said ring having an upper margin located below said openings for reinforcing
said body against flexing.

7. The sleeve of claim 6 wherein said body is made of a
pultruded long fiber reinforced thermoplastic.
10

8. The sleeve of claim 7 wherein said upper margin of said
reinforcing ring is generally aligned with a lower margin of at least one of said
vent openings.

9. A pneumatic framing nailer, comprising:
a housing enclosing a power source and including a handle;
a nosepiece depending from said housing;
a magazine connected to said nosepiece and delivering fasteners
sequentially to said nosepiece;
15 said power source including a sleeve defining a pathway for a
reciprocating piston and driver blade; and
20

said sleeve having a cylindrical tubular body made of plastic and having a lower edge, with a metal reinforcing ring integrally secured to said lower edge.

- 5 10. The sleeve of claim 9 wherein said sleeve has at least one vent opening adjacent a lower edge, and an upper margin of said reinforcing ring is generally aligned with a lower margin of said at least one vent opening.

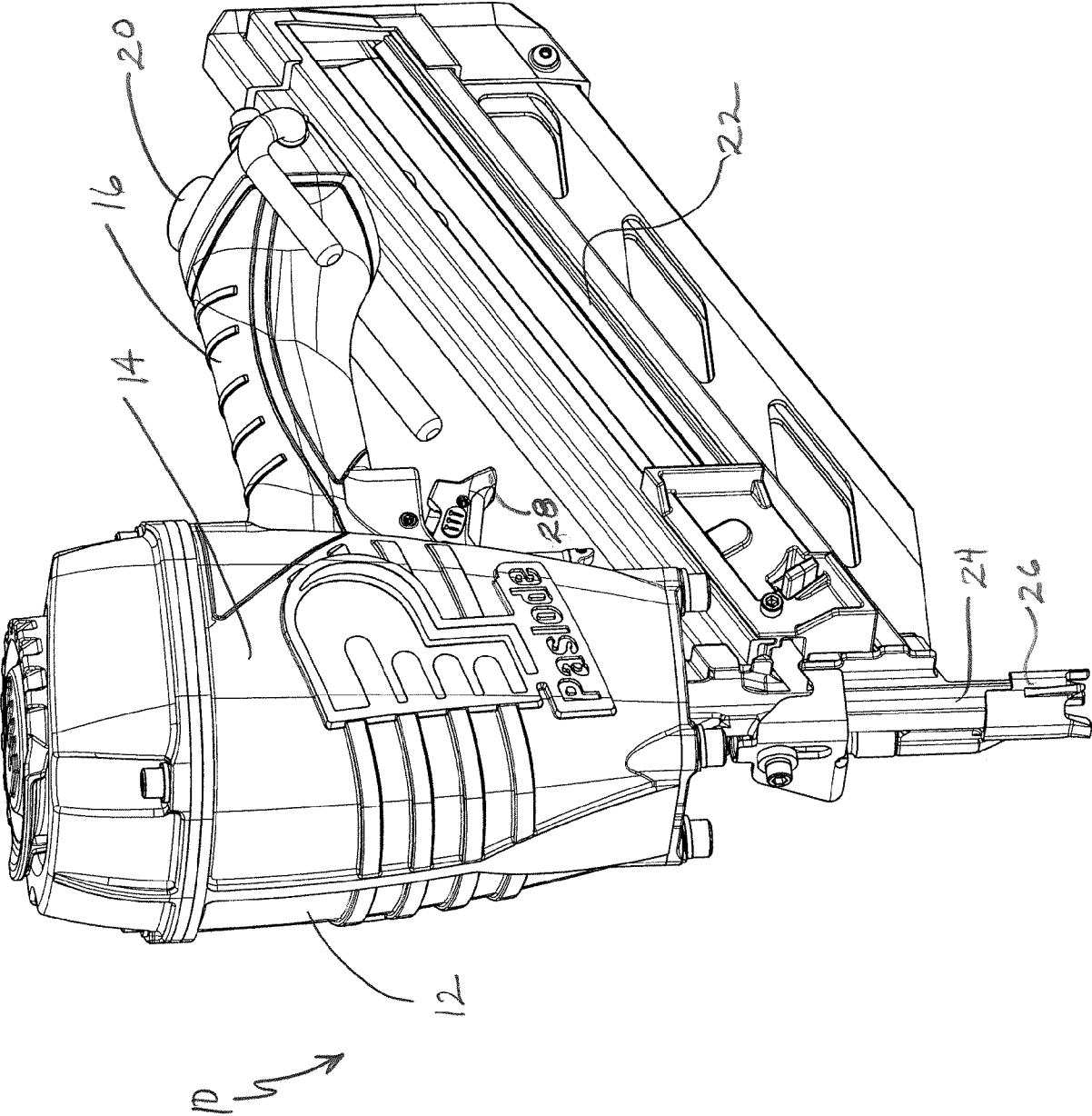


FIGURE 1

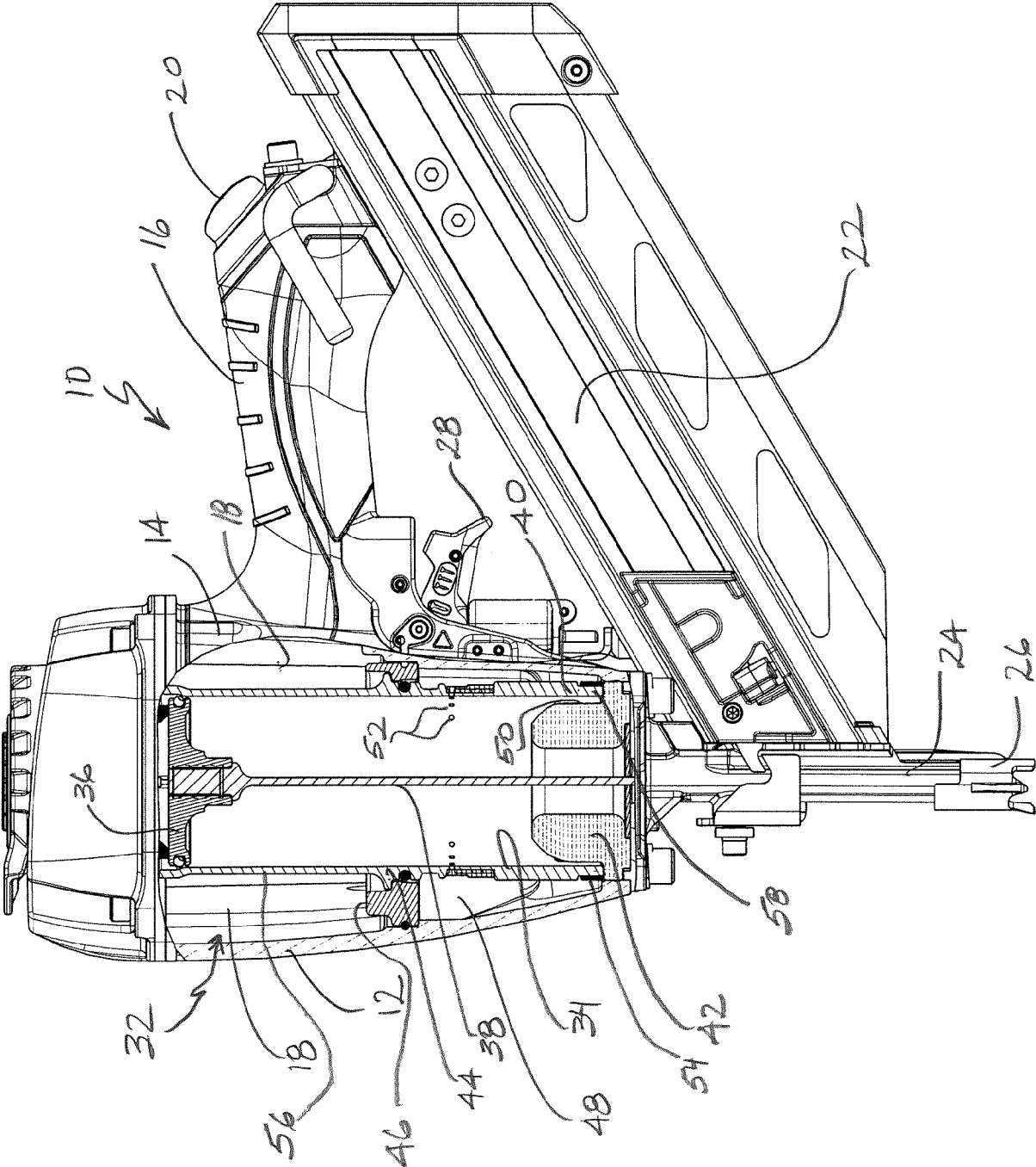


FIGURE 2:

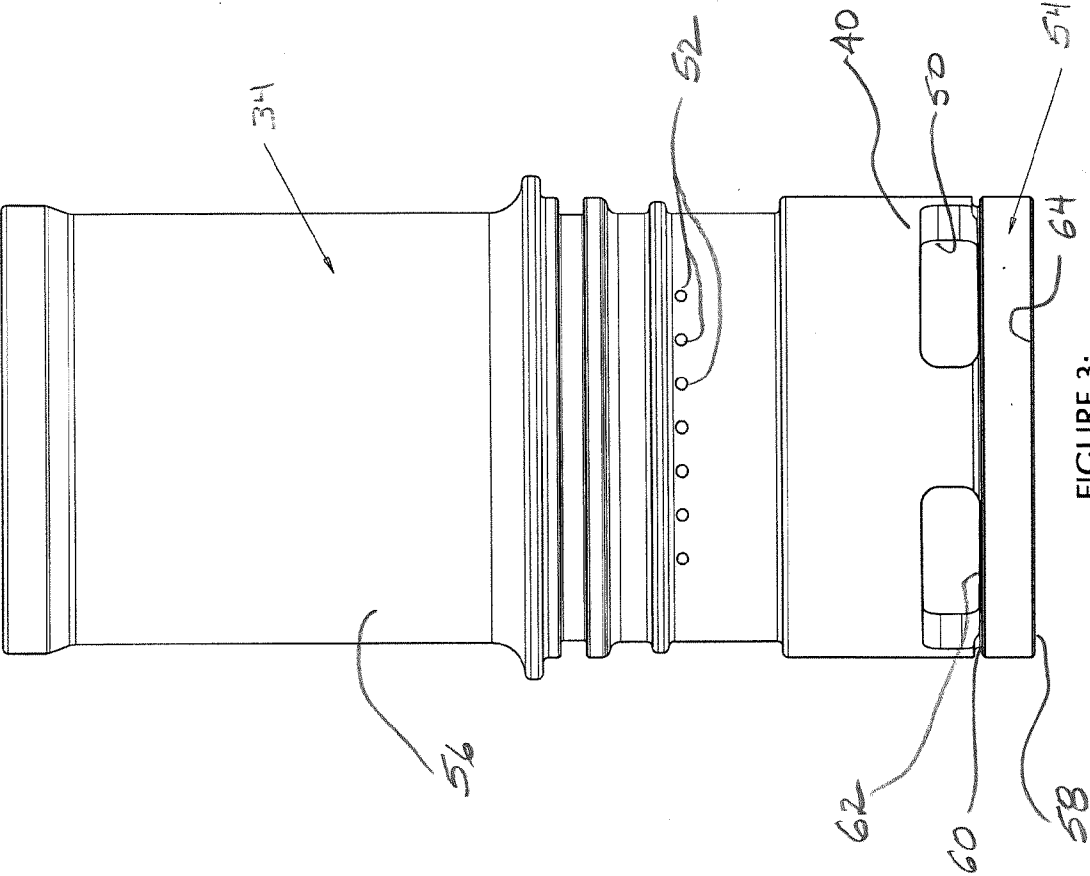


FIGURE 3:

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2012/037039

A. CLASSIFICATION OF SUBJECT MATTER
INV. B25C1/04 B25F5/02
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B25C B25F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 690 267 A (YANG BRAD [TW]) 25 November 1997 (1997-11-25) column 2; figures	1,4,5,9
X	WO 03/045637 A1 (ATLAS COPCO TOOLS AB [SE]; JANSSON ANDERS URBAN [SE]; NORDSTROEM MIKAE) 5 June 2003 (2003-06-05) pages 3,4; figures	1,9
A	US 3 871 566 A (ELLIESEN WOLFGANG ET AL) 18 March 1975 (1975-03-18) column 4; figures	1-10
A	EP 1 627 709 A2 (INGERSOLL RAND CO [US]) 22 February 2006 (2006-02-22) paragraph [0023]; figures	1-10
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Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

8 August 2012

Date of mailing of the international search report

16/08/2012

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INTERNATIONAL SEARCH REPORT

International application No

PCT/US2012/037039

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2012/037039

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