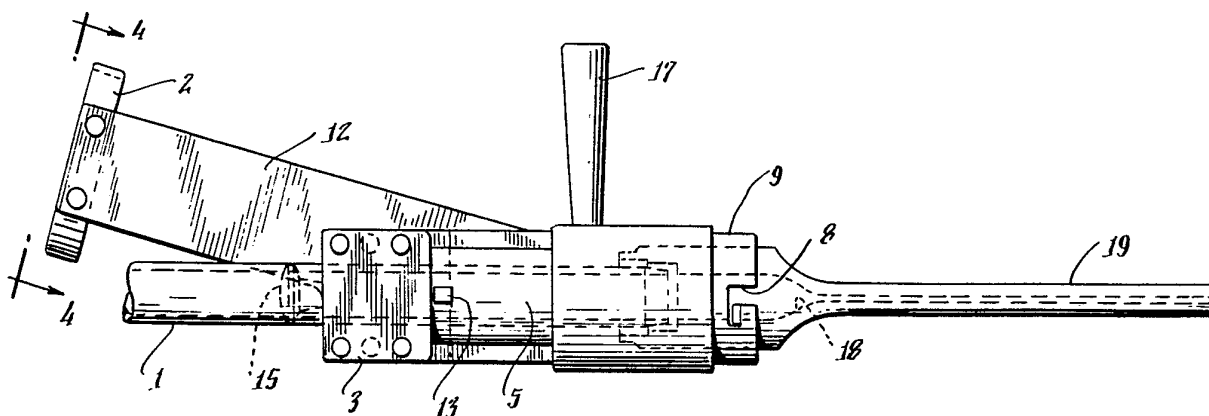




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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| <p>(51) International Patent Classification⁴ : B24C 5/04</p> | <p>A1</p> | <p>(11) International Publication Number: WO 86/ 03708 (43) International Publication Date: 3 July 1986 (03.07.86)</p> |
| <p>(21) International Application Number: PCT/US85/02467 (22) International Filing Date: 12 December 1985 (12.12.85) (31) Priority Application Number: 682,262 (32) Priority Date: 14 December 1984 (14.12.84) (33) Priority Country: US (71) Applicant: CRYOBLAST INC. [US/US]; 370 Ardale Street, West Haven, CT 06516 (US). (72) Inventor: MOORE, David, E. ; 3324 Mowbray Lane, Cincinnati, OH 45226 (US). (74) Agent: THOMPSON, Frank, J.; Thompson & Walsh, 111 Prospect Street, Stamford, CT 06901 (US).</p> | | <p>(81) Designated States: AT, AT (European patent), AU, BB, BE (European patent), BG, BR, CF (OAPI patent), CG (OAPI patent), CH, CH (European patent), CM (OAPI patent), DE, DE (European patent), DK, FI, FR (European patent), GA (OAPI patent), GB, GB (European patent), HU, IT (European patent), JP, KP, KR, LK, LU, LU (European patent), MC, MG, ML (OAPI patent), MR (OAPI patent), MW, NL, NL (European patent), NO, RO, SD, SE, SE (European patent), SN (OAPI patent), SU, TD (OAPI patent), TG (OAPI patent). Published <i>With international search report.</i></p> |

(54) Title: NOZZLE FOR CRYOGENIC CLEANING APPARATUS



(57) Abstract

An improved discharge nozzle assembly for use with a cryogenic cleaning apparatus includes an interchangeable nozzle member (19) having a constriction (18). Sublimeable pellets are carried by an air stream to the constriction (18). The constriction (18) is sized to both accelerate the air stream to a sonic velocity and to fracture the pellets entering the constriction (18). The fractured pellets present a ragged surface which enhances the cleaning operation. The nozzle member (19) is demountably positioned on the nozzle assembly by a bayonet block (8) and is secured in position against rotation by a manually actuatable spring loaded locking latch (10). The demountable nozzle member (19) is sealed against air leakage by a seal (11).

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BACKGROUND

NOZZLE FOR CRYOGENIC CLEANING APPARATUS

Field of the Invention

This invention relates to blast cleaning devices which use solid cryogenic particles as the cleaning medium. The invention relates more particularly to an improved nozzle which accelerates such solid particles to a high velocity by means of air pressure for purposes of impacting a surface to be cleaned.

Description of the Prior Art

Nozzles are known in which the air pressure and pellets entering the nozzle are accelerated to a sonic velocity which is then suitable for cleaning a contaminated surface. However, known devices of this type do not provide an adequate sealing means for the cryogenic temperatures involved. They also do not provide the proper nozzle size or nozzle length so as to be compatible with the type of pellets and amount of air being discharged.

SUMMARY OF THE INVENTION

Accordingly, it is an object of this invention to provide an improved means for accelerating transport air and pellets to a sonic velocity.

It is another object of the invention to provide an improved means for readily directing the pellets at a body to be treated.

It is a further object of the invention to provide an improved nozzle having means to fracture the pellets on entry to the nozzle to produce irregular and ragged edges for more effective cleaning.

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BRIEF DESCRIPTION OF THE DRAWINGS

These and other objects and features of the invention will become apparent with reference to the following specification and to the drawings wherein:

FIGURE 1 is a side elevation view, partly in section and partly broken away, of a nozzle of this invention;

FIGURE 2 is a reduced plan view of the nozzle of Figure 1 which illustrates the pellet passage constriction, sealing means, nozzle interchange and safety devices;

FIGURE 3 is a section taken along line 3-3 of Figure 1; and,

FIGURE 4 is an enlarged view taken along line 4-4 of Figure 2.

DETAILED DESCRIPTION

The blast nozzle accelerates pellets entering the nozzle to a sonic velocity which is then suitable for cleaning a contaminated surface. The device has a quick change nozzle arrangement to accommodate different nozzle sizes for accomplishing specific cleaning purposes. The nozzle also fractures the pellets on entry to the nozzle section and produces irregular and ragged edges on the particles for more effective cleaning.

An entry tube 1 is positioned adjacent to a base plate 12 to which is mounted a forearm stabilizer 2 which allows clearance between an operator's arm and a transport hose. An optional handle 17 is provided. A system for producing pellets is disclosed and claimed in copending U.S. application Serial No. 636,372, filed July 31, 1984 (International Patent Application PCT/US 01447, filed July 30, 1985) which is assigned to the Assignee of the invention. Pellets from the pellet source, not shown, flow through a flexible transport

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hose, not shown, to tube 1 and thence into the nozzle area where they are accelerated to sonic velocity and fractured to produce ragged edges for greater abrasiveness. The entry tube is held in place by a spacer 5 which is located between an entry guide 3 and a locating boss 14. This assembly allows an operator to rotate the nozzle assembly about its longitudinal axis within the limits of rotation of a stop 13, which comprises about 90° either side of the vertical handle position. The nozzle 19 slides into the guidesleeve 9 and is rotated to a locked position in a bayonet block 8. An anti-rotation latch 10 which is spring loaded by a spring 16 locks the nozzle to prevent rotating and unlocking. The latch release handle 15 unlocks the nozzle for removal. A nozzle seal 11 is retained in the nozzle and provides sealing between the entry tube and the nozzle entrance against air leakage. A pistol grip handle 20 supports a trigger 22. The trigger actuates a switch 24 which controls an electrically energized valve, not shown, for enabling flow of the pellets from the source. An interrupt switch 4 is also provided for disabling the flow when a palm lever 26 is released.

An improved blast nozzle has thus been described for use with a cryogenic blast cleaning apparatus. The nozzle advantageously facilitates substitution of members to meet specific applications, provides for fracturing incoming pellets and provides an enhanced seal.

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What is claimed is:

1. A nozzle for directing pellets at a body to be cleaned, said pellets formed of a solid state material which sublimates to a vapor state after impact with the body, comprising:

(a) an elongated nozzle body having a pellet entrance constriction thereof;

(b) a support member for demountable receiving and supporting said nozzle body;

(c) means for conveying pellets to said support means for acceleration toward said constriction;

(d) said constriction having a limiting passage which is smaller in cross-sectional area than pellets conveyed to said nozzle body whereby said pellets are fractured upon impact with said constriction and are accelerated to a sonic velocity.

2. The apparatus of Claim 1 including means for demountable positioning said nozzle body on said support body.

3. The apparatus of Claim 2 including means for providing an airtight seal between said demountable nozzle body and said supporting body.

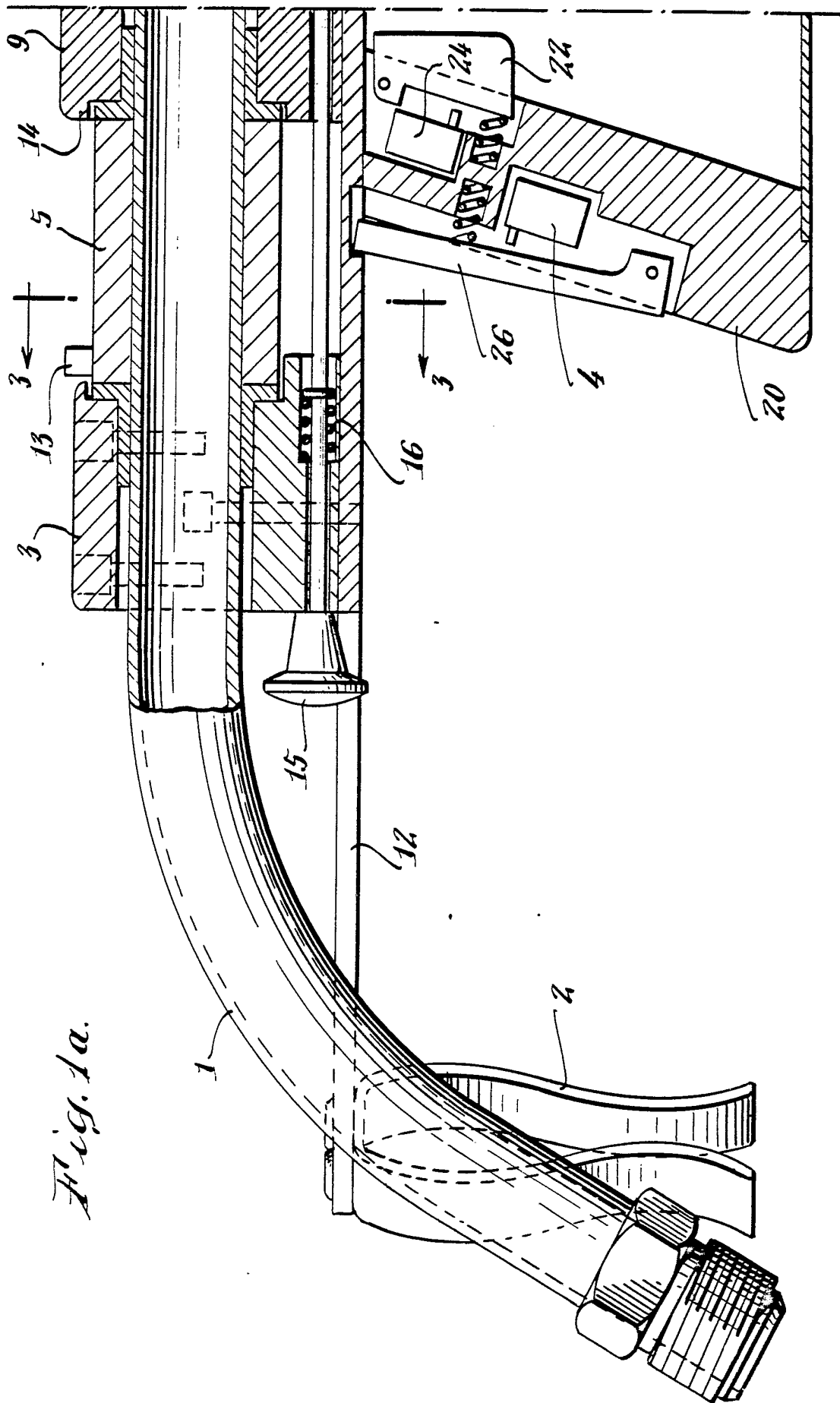


Fig. 1a.

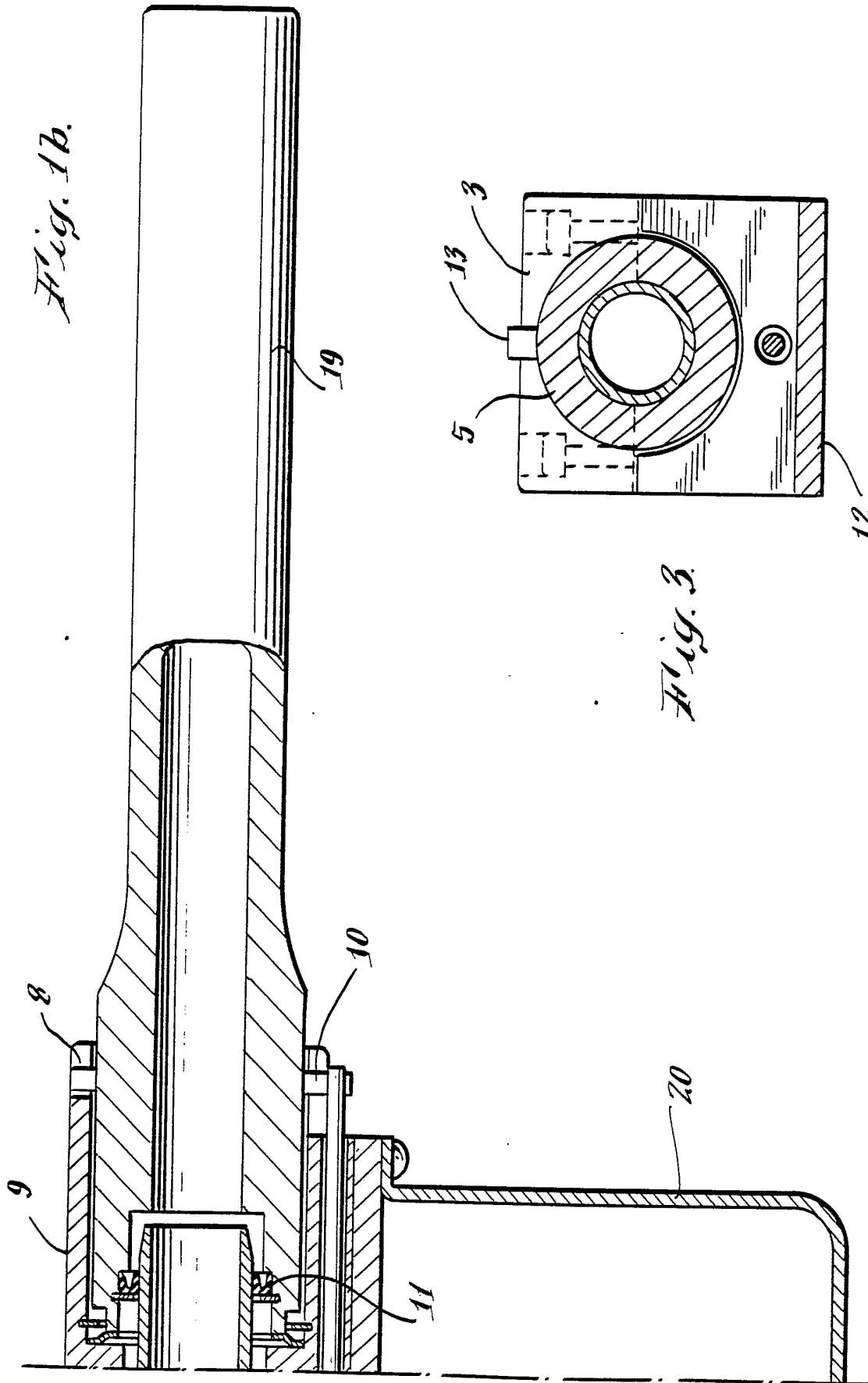
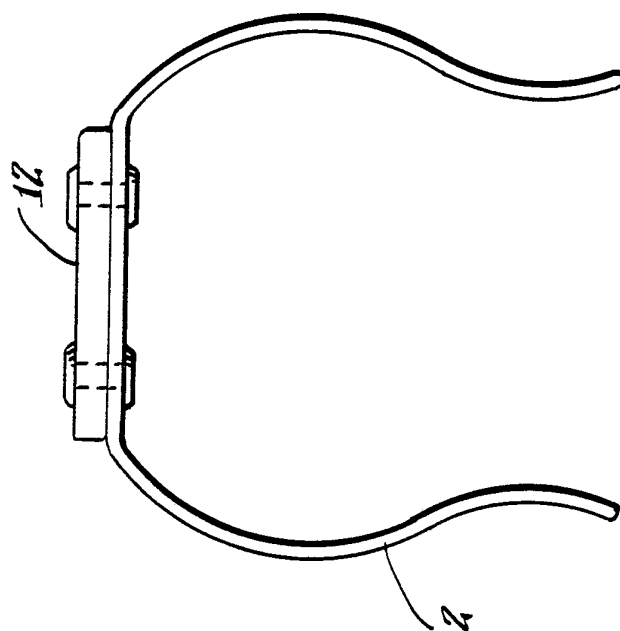
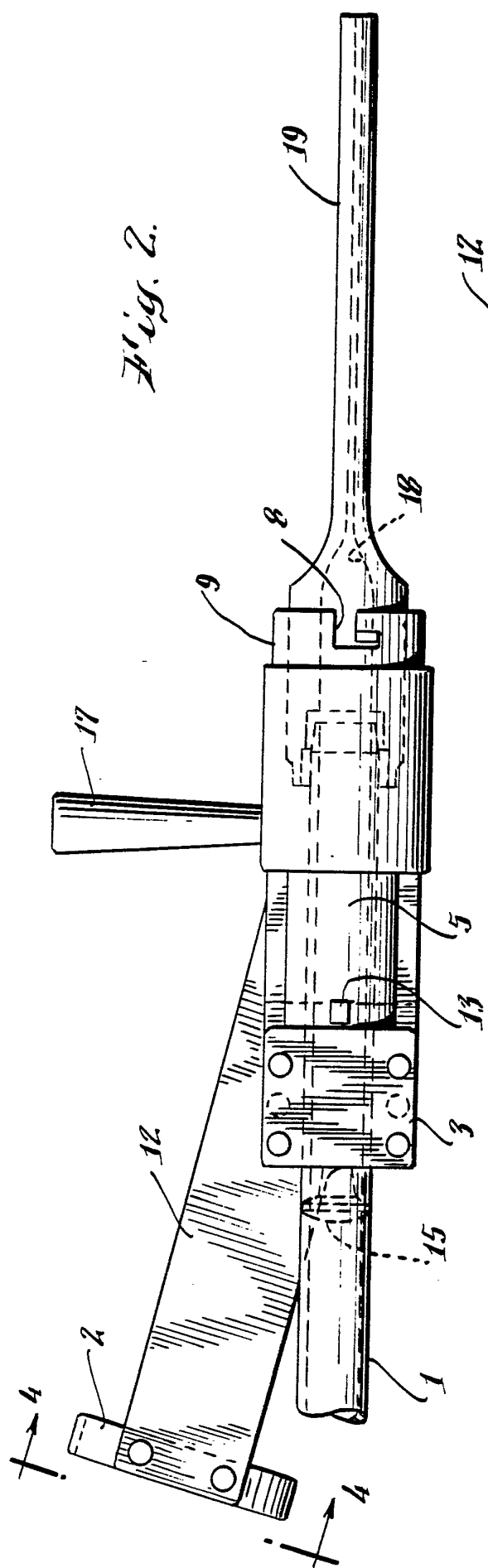


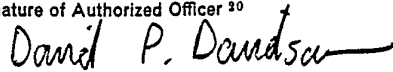
Fig. 1b.

Fig. 3.



INTERNATIONAL SEARCH REPORT

International Application No PCT/ US85/ 02467

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| I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ³ | | |
| According to International Patent Classification (IPC) or to both National Classification and IPC U.S. Cl. 239/590, 600; 51/439 INT. Cl. B24C 5/04 | | |
| II. FIELDS SEARCHED | | |
| Minimum Documentation Searched ⁴ | | |
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| U.S. | 239/ 590, 594, 600, DIG 21; 51/ 427, 439 | |
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| | | |
| III. DOCUMENTS CONSIDERED TO BE RELEVANT ¹⁴ | | |
| Category * | Citation of Document, ¹⁶ with indication, where appropriate, of the relevant passages ¹⁷ | Relevant to Claim No. ¹⁸ |
| A | US, A, 2,836,013, (KOENIG) 27 MAY 1958. | 2 |
| A | US, A, 3,228,147, (MOORE) 11 JANUARY 1966. | 1-3 |
| A | US, A, 3,705,693, (FRANZ) 12 DECEMBER 1972. | 3 |
| Y,P | US, A, 4,478,368, (YIE) 23 OCTOBER 1984. | 1-3 |
| A | SU, A, 889,151, (SHESTERENKO) 21 MARCH 1980. | 1 |
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| IV. CERTIFICATION | | |
| Date of the Actual Completion of the International Search ³ | Date of Mailing of this International Search Report ³ | |
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