



Plant and Machinery 17 (August 1979)

These Guidance Notes are published under five subject headings: Medical, Environmental Hygiene, Chemical Safety, Plant and Machinery and General.

INTRODUCTION

1 Pneumatic nailing and stapling tools are widely used in industry in the production of wooden articles and in upholstery work. They are also used to a limited extent in building and construction work. The object of this Guidance Note is to describe the tools, identify the cause of accidents and outline the safety precautions to be observed in design, maintenance and operation.

CLASSIFICATION

2 Tools are hand held and comprise a main body casting, a driving unit and a magazine which holds the nails or staples. Depression of a trigger and, on some machines,

operation of a work-contacting element, operates the tool and drives the fastener. They may be classified as large or small, depending upon the size of fastener which they drive, and typical examples of each are shown in Figs 1 and 2 respectively.

Large tools

3 This group includes all tools which are capable of driving fasteners above 25 mm in length. Tools in this group are fitted with a work contacting element as shown in Fig 1 and this has to be depressed against the workpiece and the trigger operated in order to drive the fastener. The fitting of a work-contacting element is essential since a fastener accidentally projected into free space will have sufficient kinetic energy during most of its flight to cause injury to any person in its path.

Small tools

4 This group includes all tools capable of driving a fastener up to 25 mm in length. While some are used to

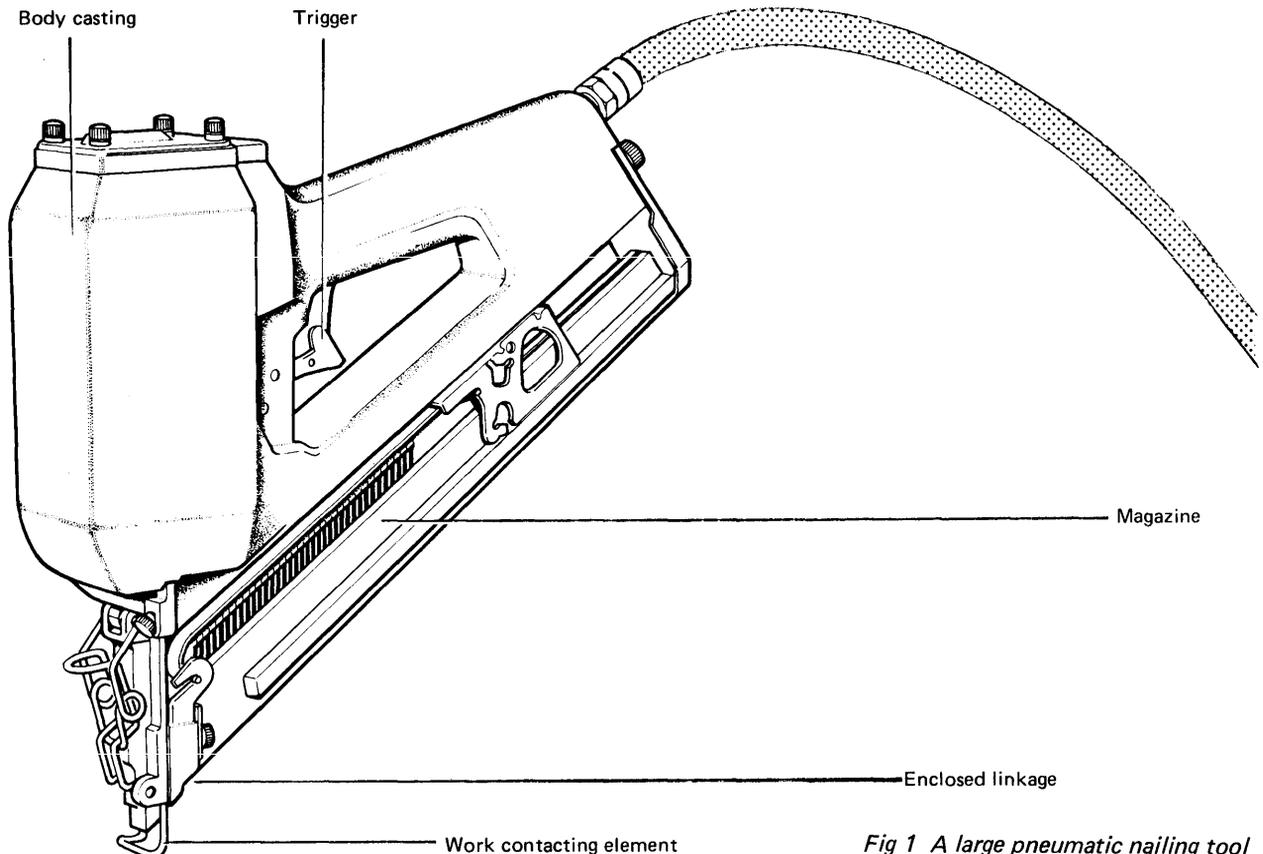


Fig 1 A large pneumatic nailing tool

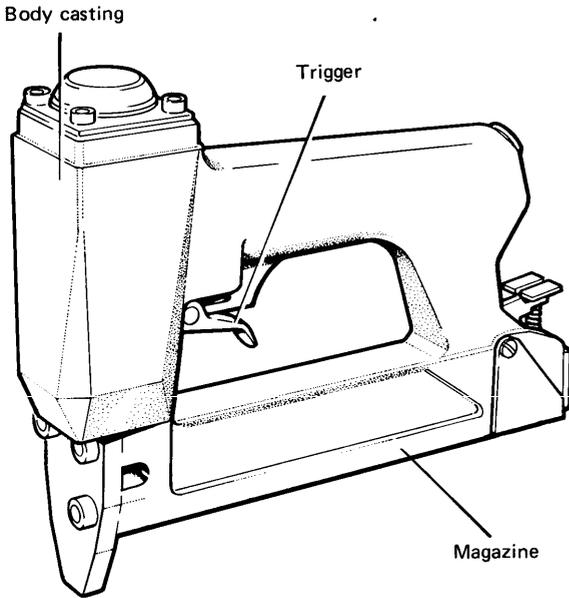


Fig 2 A typical small tool

drive nails, the majority drive staples. The kinetic energy of a fastener driven accidentally is dissipated rapidly and is insufficient to cause serious injury unless the tool is very close (less than 150 mm) to a vulnerable part of the body. The fitting of work-contacting element is therefore not essential and operation is usually initiated by means of the trigger only (Fig 2). However, work-contacting elements are sometimes fitted to facilitate the bump driving method (see below).

METHODS OF OPERATION

Bump or bottom driving

5 This method is applicable to tools fitted with work-contacting elements where the operator holds the trigger depressed and operates the tool by striking the element against the work.

Multiple drive

61 The driving of fasteners is continuous while the trigger is held depressed, and the tool is used by holding it in contact with the work and traversing the surface. In order for this method to be used, the tool must be fitted with an adjustable time-sequencing device which permits driving to proceed automatically on a timed sequence while the trigger and, where fitted, the work-contacting element are held depressed.

Single drive (restrictive trigger)

7 After each operation, the trigger must be released before a subsequent fastener can be driven. If the tool is removed from the workpiece, it cannot be operated again until the trigger has been released, the work-contacting element depressed and the trigger operated again. This prevents the tool from being operated by accidentally depressing the work-contacting element while the trigger is being held continuously depressed. Many 'bump drive' tools can be modified for single-drive working.

ACCIDENT CAUSATION

The causes of accidents fall into the following categories:

Operator's error

8 The tool may be operated when the operator's hand is on the workpiece and in the line of fire, or a fastener may be deflected away from the workpiece and strike the operator.

Misuse

9 Operation may occur if the trigger is held depressed continuously and the work contacting element is struck inadvertently. Unexpected operation may occur if the operator attempts to clear a blockage without first disconnecting the air line or taking other precautions. A tool may also be operated by the deliberate compression of the work-contacting element when the tool is not in normal use; for example, when clearing a blockage in horseplay.

Design or manufacturing fault

10 Failure of some part of the tool due to a design or manufacturing fault may cause the tool to operate.

Inadequate maintenance

11 Malfunctioning of a tool may occur due to poor maintenance, particularly insufficient cleaning.

SAFETY PRECAUTIONS

12 The following safety precautions should be observed in the design, maintenance and operation of pneumatic nailing and stapling tools:

- (a) Large tools should be fitted with a work-contacting element and the contact area should be as small as practicable.
- (b) As a precaution against accidental operation the trigger should be guarded or so positioned that it is protected by the body of the gun.
- (c) The mechanical linkage, where fitted, between the work-contacting element and the trigger should be enclosed.
- (d) Quick release couplings should be provided in the air line to the tool. With the air supply disconnected, the air in the tool should be immediately exhausted, thus rendering it inoperable.
- (e) The tool should be examined by a competent person at least weekly and kept clean.
- (f) Where reasonably practicable, the tool should be modified and used for 'single drive' only.
- (g) The operator should be fully instructed, in accordance with the maker's recommendations, in the safe operation of the tool and the safety precautions to be observed.
- (h) The operator, and other persons in the vicinity, should wear suitable eye protection.

- (i) Before an attempt is made to clear a blockage at the nose of the tool, the air supply should be disconnected.
- (j) When not in use, the tool should be disconnected from the air supply. It is dangerous to isolate the tool by means of a stop valve in the air supply pipe as there may be sufficient air pressure remaining in the tool or hose to allow it to operate.
- (k) Only dry, clean, regulated compressed air should be used to operate the tool.

ACCIDENTS

13 An analysis of accidents in 1975 shows that all injuries resulted from penetration or laceration by the fastener. Of the total of 84 accidents (see table below) simple flesh wounds accounted for 74, bone injuries 5 and eye injuries 5. In addition to the 5 eye injuries, there were 58 injuries to the hands, 11 to the legs, 7 to the feet and 3 to other parts of the body. None of the accidents resulted in permanent disability.

14 An examination of the 66 large tools showed that 2 were not fitted with a work-contacting element and 31 did not have the element linkage guarded. A total of 19 tools had been modified for single-drive working.

15 It would appear that the number of accidents is low in relation to the large number of tools in use and the survey shows that the majority of the injuries were slight. The adoption of the single-drive method of operation would have significantly reduced the 34 accidents caused by misuse of large tools. The wearing of eye protection by operators would have prevented the eye injuries.

16 Accidents with pneumatic nailing and stapling tools – 1975:

Cause	Type of tool		Total
	Small	Large	
Operator's error	12	26	38
Misuse	6	34	40
Manufacturing fault		3	3
Poor maintenance		3	3
Total	18	66	84

NOISE

17 The maximum permissible daily exposure of unprotected ears to a fluctuating sound is equivalent to a con-

tinuous sound level of 90dB(A) for 8 hours, i.e. the equivalent sound level (Leq) should not exceed 90dB(A) (see References).

18 Pneumatic nailing and stapling tools should be designed to be as quiet as is reasonably practicable and the sound level of each tool should be specified by the manufacturer. Since the tools are commonly used in groups and noise is additive, allowance should be made for the cumulative effect. It is therefore recommended that the information provided by the manufacturer should include the number of operations which will produce an Leq of 84dB(A).

19 The employer should adopt a system of work which ensures that exposure to noise is kept as low as is reasonably practicable, but if the Leq is likely to exceed 90db(A) suitable ear protection should be worn by the operator and other persons similarly exposed.

POWER FASTENINGS ASSOCIATION

20 The Power Fastenings Association is an association of suppliers of nailing and stapling tools. The Association has produced a code of practice, *Safety requirements for portable air actuated fastener driving tools* which augments the recommendations in this guidance note. Copies are available from The Power Fastenings Association, Cripps and Shone, Aries House, Straight Bit, Flackwell Heath, High Wycombe, Bucks HP10 9NB.

REFERENCES

- 1 The Woodworking Machines Regulations 1974 (S1 1974 No 903), HMSO.
- 2 *Code of Practice for reducing the exposure of employed persons to Noise*, a Department of Employment publication prepared by the Industrial Health Advisory Committee's Sub-Committee on Noise, HMSO, 1972.

FURTHER INFORMATION

This Guidance Note is produced by the Health and Safety Executive. Further advice on this or any other publications produced by the Executive is obtainable from Baynards House, 1 Chepstow Place, London W24TF, or from Area Offices of the HSE.

General Series

GS 1	Fumigation using methyl bromide
GS 2	Metrication of construction safety regulations
GS 3	Fire risk in the storage and industrial use of cellular plastics
GS 4	Safety in pressure testing
GS 5	Entry into confined spaces
GS 6	Avoidance of danger from overhead electrical lines
GS 7	Accidents to children on construction sites
GS 8	Articles and substances for use at work - guidance for designers, manufacturers, importers, suppliers, erectors and installers

Plant and Machinery Series

PM 1	Guarding of portable pipe-threading machines
PM 2	Guards for planing machines
PM 3	Erection and dismantling of tower cranes
PM 4	Safety at high temperature dyeing machines
PM 5	Automatically controlled steam and hot water boilers
PM 6	Dough dividers
PM 7	Lifts
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PM 13	Zinc embrittlement of austenitic stainless steel
PM 14	Safety in the use of cartridge operated tools
PM 15	Safety in the use of timber pallets
PM 16	Eyebolts
PM 17	Pneumatic nailing and stapling tools

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MS10	Heat conditions and tenosynovitis
MS12	Mercury - medical surveillance
MS13	Asbestos
MS15	Welding
MS16	Training of offshore sick-bay attendants ('rig-medics')

Environmental Hygiene series

EH 2	Chromium - health and safety precautions
EH 4	Aniline - health and safety precautions
EH 5	Trichloroethylene
EH 6	Chromic acid concentrations in air
EH 7	Petroleum based adhesives in building operations
EH 8	Arsenic - health and safety precautions
EH 9	Spraying of highly flammable liquids
EH 10	Asbestos - hygiene standards and measurements of airborne dust concentrations
EH11	Arsine - health and safety precautions
EH 12	Stibine - health and safety precautions
EH 13	Beryllium - health and safety precautions
EH 14	Level of training for technicians making noise surveys
EH 15/78	Threshold limit values
EH 16	Isocyanates : toxic hazards and precautions
EH17	Mercury - health and safety precautions
EH 18	Toxic substances : a precautionary policy
EH 19	Antimony - health and safety precautions
EH 20	Phosphine - health and safety precautions
EH 21	Carbon dust : health and safety precautions
EH 22	Ventilation of buildings : fresh air requirements