



The American Society of
Mechanical Engineers

A N A M E R I C A N N A T I O N A L S T A N D A R D

LOCKING PLIERS

ASME B107.24-2002

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CONTENTS

Foreword	iv
Committee Roster	v
Correspondence With the B107 Committee	vi
1 Scope	1
2 Classification	1
3 Normative References	1
4 Requirements	1
5 Testing Procedures	3
6 Type, Class, and Style Provisions	8
7 Designations	8
Figures	
1 Typical Release Mechanisms for Locking Pliers	2
2 Type I, Class 2, Styles A and B, Curved Jaw Without and With Cutter (Style B Shown)	9
Tables	
1 Locking/Load Test for Type I, Locking Pliers	2
2 Jaw Grip Test, Classes 1, 2, and 3	2
3 Jaw Clearance Test, Class 2	2
4 Type I, Class 1, Style A, Straight Jaw Without Cutter	4
5 Type I, Class 2, Style A, Curved Jaw Without Cutter	5
6 Type I, Class 2, Style B, Curved Jaw With Cutter	5
7 Type I, Class 3, Styles A and B, Long Nose With and Without Cutter	6
8 Type I, Class 4, Style A, Smooth Jaw Without Cutter	7

FOREWORD

The American National Standards Committee B107, Socket Wrenches and Drives, under sponsorship of The American Society of Mechanical Engineers, was reorganized as an ASME Standards Committee, and its title was changed to Hand Tools and Accessories. In 1996 its scope was expanded to address safety considerations.

The purposes of this Standard are to define general and dimensional data and safety considerations specifically applicable to locking pliers and to specify test methods to evaluate performance relating to the defined requirements.

The format of this Standard is in accordance with *The ASME Codes and Standards Writing Guide 2000*. Requests for interpretations of the technical requirements of this Standard should be expressed in writing to the Secretary, B107 Standards Committee, at the address below.

Suggestions for the improvement of this Standard are welcome. They should be addressed to: The American Society of Mechanical Engineers, Secretary, B107 Standards Committee, Three Park Avenue, New York, NY 10016-5990.

The requirements of this Standard become effective at the time of publication. This new American National Standard was approved on November 8, 2002.

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Hand Tools and Accessories

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General. ASME standards are developed and maintained with the intent to represent the consensus of concerned interests. As such, users of this Standard may interact with the Committee by requesting interpretations, proposing revisions, and attending Committee meetings. Correspondence should be addressed to:

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Proposing Revisions. Revisions are made periodically to the Standard to incorporate changes that appear necessary or desirable, as demonstrated by the experience gained from the application of the Standard. Approved revisions will be published periodically.

The Committee welcomes proposals for revisions to this Standard. Such proposals should be as specific as possible, citing the paragraph number(s), the proposed wording, and a detailed description of the reasons for the proposal, including any pertinent documentation.

Interpretations. Upon request, the B107 Committee will render an interpretation of any requirement of the Standard. Interpretations can only be rendered in response to a written request sent to the Secretary of the B107 Standards Committee.

The request for interpretation should be clear and unambiguous. It is further recommended that the inquirer submit his/her request in the following format:

Subject:	Cite the applicable paragraph number(s) and the topic of the inquiry.
Edition:	Cite the applicable edition of the Standard for which the interpretation is being requested.
Question:	Phrase the question as a request for an interpretation of a specific requirement suitable for general understanding and use, not as a request for an approval of a proprietary design or situation. The inquirer may also include any plans or drawings, which are necessary to explain the question; however, they should not contain proprietary names or information.

Requests that are not in this format will be rewritten in this format by the Committee prior to being answered, which may inadvertently change the intent of the original request.

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Attending Committee Meetings. The B107 Standards Committee regularly holds meetings, which are open to the public. Persons wishing to attend any meeting should contact the Secretary of the B107 Standards Committee.

LOCKING PLIERS

1 SCOPE

This Standard covers the dimensions and functional characteristics of locking pliers that are suitable for gripping and wrenching operations. Some of the locking wrench pliers are provided with cutters. Inclusion of dimensional and functional data in this Standard is not intended to imply that all products described herein are stock production sizes. Consumers are requested to consult with manufacturers concerning lists of stock production sizes.

2 CLASSIFICATION

Pliers covered by this Standard shall be of the following type, class, and style, as specified.

Type I: Locking Pliers

Class 1: Straight Jaws

Style A: Without Cutter

Class 2: Curved Jaws

Style A: Without Cutter

Style B: With Cutter

Class 3: Long Nose

Style A: Without Cutter

Style B: With Cutter

Class 4: Smooth Jaws

Style A: Without Cutter

Type II: Reserved for Future Use

3 NORMATIVE REFERENCES

The following is a list of publications referenced in this Standard.

ASME B46.1-1995, Surface Texture (Surface Roughness, Waviness, and Lay)

ASME B107.25-2002, Pliers: Performance Test Methods
Publisher: The American Society of Mechanical Engineers (ASME International), Three Park Avenue, New York, NY 10016-5990; Order Department: 22 Law Drive, Box 2300, Fairfield, NJ 07007-2300

4 REQUIREMENTS

4.1 Illustrations

Illustrations shown herein are descriptive and not restrictive, and are not intended to preclude the manufacture of pliers that are otherwise, in accordance with this Standard.

4.2 Material

Materials used in the manufacturing of the pliers shall be such as to produce pliers conforming to the requirements hereinafter specified.

4.3 Design

Pliers shall be similar to the figure to which reference is made and shall be proportioned in all parts so as to meet the requirements of this Standard. Pliers shall be provided with a toggle or cam device having an adjustable mechanism designed so that the jaws can be clamped and locked. Pliers shall be released by hand anywhere within the capacity of the pliers by any release mechanism similar to Fig. 1. Test specimens shall withstand applicable test procedures without cracking or breaking.

4.4 Handles

Handles of pliers shall be through hardened from 30 HRC to 50 HRC or case hardened from 75 HR15N to 86 HR15N with a case depth of a minimum of 0.010 in. (0.25 mm). Handles shall be so shaped as to afford a comfortable grip and shall be free from rough edges and sharp corners. The minimum handle clearance between the fixed and moveable handle shall be as specified in the appropriate tables, when the pliers are locked in any position of the jaws. Outer hand-gripping surfaces of handles shall be smooth, knurled, or impressed.

4.5 Joints

Pliers joints shall have no excessive looseness, play, or any other indications of side play of the two halves of the pliers when opened or closed that would impair the function of pliers. Joint fasteners shall be through hardened from 25 HRC to 50 HRC. Where fasteners receive a case hardening treatment in addition to the through hardening, a maximum hardness of 60 HRC or equivalent will be permitted.

4.6 Jaws

4.6.1 Jaw Openings. Ends of jaws shall open, when adjusted by the screw, to the respective minimum distance specified in Tables 4 through 8. Pliers shall operate in a smooth and uniform manner.

4.6.2 Jaw Hardness. Jaws shall be through hardened from 45 HRC to 60 HRC or case hardened from 83

Table 1 Locking/Load Test for Type I, Locking Pliers

Classification	Nominal Size		Maximum Load to Lock Handles		Minimum Test Load on Jaw Tips	
	in.	mm	lbf	N	lbf	N
Class 1	5½	140	45	200	900	4 000
	7	178	45	200	2,500	11 120
	8½	216	45	200	2,500	11 120
Class 2	4¼	108	45	200	800	3 560
	5½	140	45	200	900	4 000
	7	178	45	200	2,500	11 120
	8½	216	45	200	2,500	11 120
Class 3	5¼	133	45	200	400	1 780
	6½	165	45	200	450	2 000
	8½	216	45	200	900	4 000
Class 4	5½	140	45	200	900	4 000
	7	178	45	200	2,500	11 120
	8½	216	45	200	2,500	11 120

Table 2 Jaw Grip Test, Classes 1, 2, and 3

Nominal Size		Mandrel Size				Mandrel Hardness		Minimum Test Torque			
		Diameter		Hexagon		Diameter, Maximum HRB	Hexagon, HRC	Diameter		Hexagon	
in. ±½	mm ±12.7	in.	mm	in.	mm			lbf-in.	N-m	lbf-in.	N-m
4¼	108	0.38	9.7	0.38	9.7	100	45-55	200	22.6	270	30.5
5½	140	0.50	12.7	0.50	12.7	100	45-55	225	25.4	300	33.9
7	178	0.75	19.1	0.75	19.1	100	45-55	300	33.9	450	50.8
8½	216	0.75	19.1	0.75	19.1	100	45-55	480	54.2	900	101.7

Table 3 Jaw Clearance Test, Class 2

Nominal Size		NO-GO Gage, Diameter		GO Gage, Diameter	
		in.	mm	in.	mm
4¼	108	0.203 ± 0.003	5.16 ± 0.08	0.141 ± 0.003	3.58 ± 0.08
5½	140	0.218 ± 0.003	5.54 ± 0.08	0.156 ± 0.003	3.96 ± 0.08
7	178	0.312 ± 0.003	7.92 ± 0.08	0.218 ± 0.003	5.54 ± 0.08
8½	216	0.375 ± 0.003	9.53 ± 0.08	0.281 ± 0.003	7.14 ± 0.08

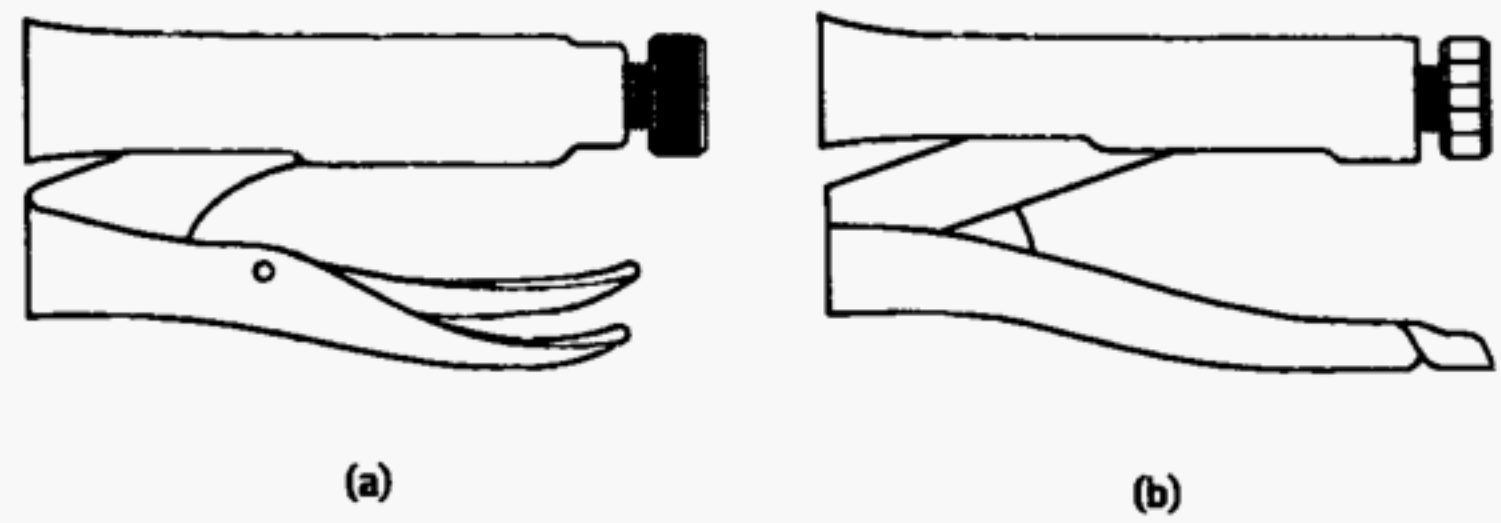


Fig. 1 Typical Release Mechanisms for Locking Pliers

HR15N to 90 HR15N with a case depth minimum of 0.010 in. (0.25 mm).

4.6.3 Jaw Serration. Serrated surfaces for Classes 1, 2, and 3 shall have continuous and uniform sharp projections.

4.7 Adjusting Screw

Adjusting screw located at the end of the handle shall have a minimum hardness of 30 HRC.

4.8 Marking

Pliers shall be marked in a plain and permanent manner with the manufacturer's name or with a trademark of such known character that the source of manufacture and country of origin shall be readily determined. Marking shall be as permanent as the normal life expectancy of the pliers, providing the surface to which it was applied has not been subjected to a fretting or abrading action, and is capable of withstanding the cleaning normally experienced during its intended use.

4.9 Finish

4.9.1 Appearance. Surfaces shall be tested in accordance with ASME B46.1. Surfaces shall be free from pits, nodules, burrs, and other conditions that may adversely affect the performance or appearance. Ground surfaces shall have a maximum surface roughness of 200 μ in. (5.1 μ m) arithmetic average. Measurement of the finish shall be made with a measuring instrument using a cutoff length of 0.03 in. (0.8 mm).

4.9.2 Coating. Coatings shall be adherent, smooth, continuous and free of pits, blisters, nodules, oxide scale, and any other conditions that may interfere with the protective value and serviceability of the pliers. Cadmium plate will not be allowed. Pliers shall be coated with a supplementary rust preventative treatment.

4.10 Spring

Spring shall be capable of opening the jaws to the respective minimum jaw opening tip-to-tip dimension as specified in the tables for the individual type and class of pliers.

4.11 Dimensions

Dimensions shall be determined by measuring the pliers with jaws in the closed and locked position. The overall length measurement shall include the adjusting screw.

4.12 Workmanship

Requirements within this Standard are intended to describe the best commercial quality pliers available. Pliers shall conform to the requirements of this Standard.

5 TESTING PROCEDURES

5.1 Safety

WARNING: MANY TESTS REQUIRED HEREIN ARE INHERENTLY HAZARDOUS AND ADEQUATE SAFEGUARDS FOR PERSONNEL AND PROPERTY SHALL BE EMPLOYED IN CONDUCTING SUCH TESTS.

5.2 Testing

5.2.1 Hardness Test. Hardnesses specified herein shall be tested in accordance with ASME B107.25, para. 5.3.

5.2.2 Cut Test for Type I, Class 2, Style B and Class 3, Style B. The 4¼ in. (108 mm), 5½ in. (140 mm), and 5¾ in. (133 mm) pliers shall cut 0.048 in. \pm 0.003 in. (1.22 mm \pm 0.08 mm) diameter steel wire without readjusting the pliers. Force required to lock the toggle mechanism and complete the cut shall not exceed 35 lbf (155 N). The 7 in. (178 mm) and 8½ in. (216 mm) pliers shall cut 0.091 in. \pm 0.003 in. diameter (2.31 mm \pm 0.08 mm) steel wire in not more than three progressive adjustments. Force required to lock the toggle mechanism in making each progressive cut shall not exceed 70 lbf (310 N). Steel wire used in these tests shall have a minimum tensile strength of 200,000 psi (1 378 MPa). Deformation or breakage of any part of the pliers shall be cause for rejection.

5.2.3 Locking/Load Test. Pliers shall be tested on a system capable of applying the required minimum test load given in Table 1. The plier handles shall be locked, using maximum value shown in Table 1. Test load shall be applied to the jaw tips in a direction to spread the jaw clamping surfaces apart for a minimum of 10 sec. Pliers shall remain locked while the load is applied. Pliers shall have passed the test if the jaw tips close and all the joints and adjusting screw work properly after removal of the load.

5.2.4 Jaw Grip Test

(a) *Jaw Grip Test, Classes 1, 2, and 3.* Pliers shall be tested on both round and hexagonal steel mandrels. Pliers shall withstand the test torque specified in Table 2. The mandrels shall be gripped at the center of the jaws, and the hexagonal mandrel shall be gripped across corners. A locking load from 30 lbf (133 N) to 35 lbf (155 N) shall be applied to lock the toggle mechanism. When the torque is applied, the mandrel shall not turn in the jaws. Deformation or breakage of any part of the pliers shall be cause for rejection.

(b) *Jaw Grip Test, Class 4.* Class 4 pliers shall be tested by gripping two pieces of rolled commercial brass 0.13 in. (3.3 mm) thick by approximately 0.88 in. (22.4 mm) wide by 6 in. (152 mm) long and a hardness from 56 HRB to 61 HRB. With the ends overlapping approximately 0.50 in. (12.7 mm), the two pieces of brass shall be gripped with the pliers under load. A locking load

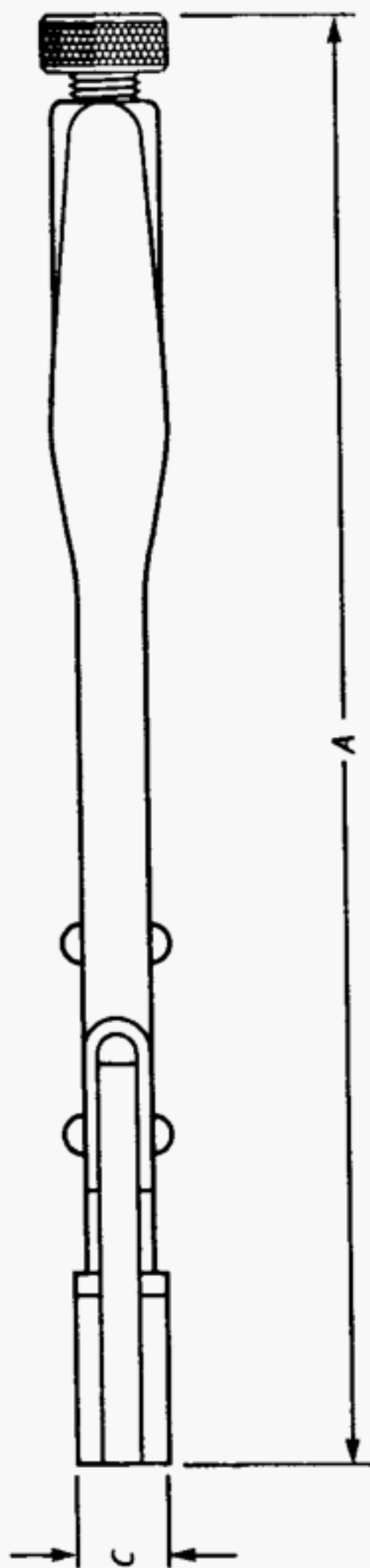
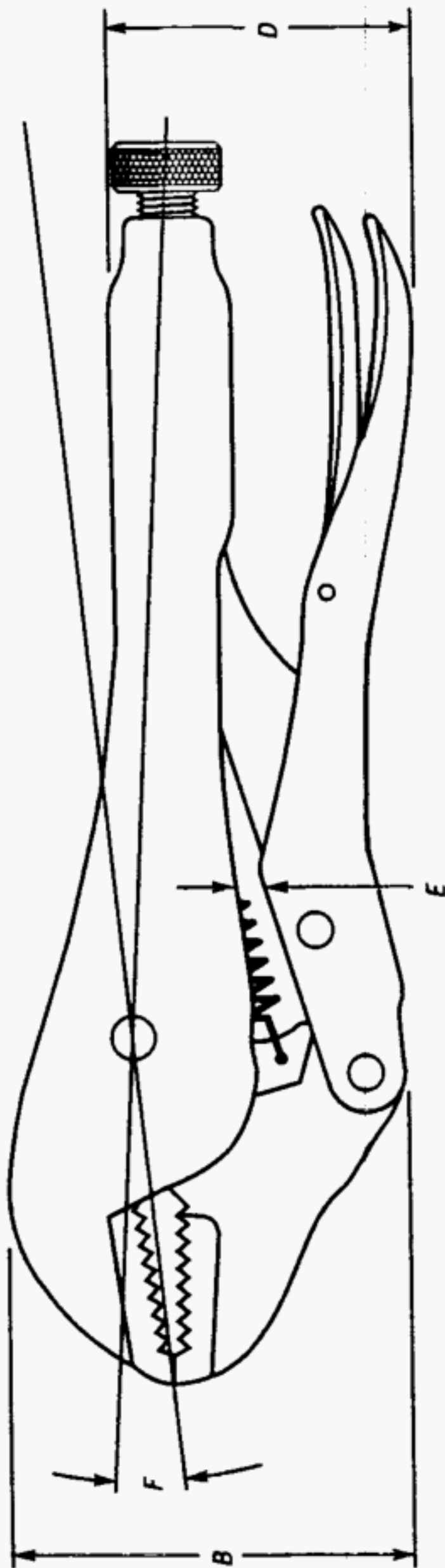


Table 4 Type I, Class 1, Style A, Straight Jaw Without Cutter

Nominal Size	Overall Length, A		Height, B		Jaw Tip Thickness, C		Handle Width, D		Minimum Handle Clearance, E		Jaw Angle, F, deg		Minimum Jaw Opening Tip-to-Tip		Jaw Opening at Parallel Position	
	In.	mm	In.	mm	In.	mm	In.	mm	In.	mm	±5		In.	mm	In.	mm
5 1/2	±0.63	±16.0	±0.38	±9.7	±0.13	±3.3	±0.50	±12.7					1.13	28.7	0.38	9.7
7	5.5	139.7	1.56	39.6	0.44	11.2	1.50	38.1	0.09	2.3	10		1.31	33.3	0.56	14.2
8 1/2	7.0	177.8	2.25	57.2	0.44	11.2	1.88	47.8	0.16	4.1	10		1.75	44.5	0.63	16.0
	8.5	215.9	2.63	66.8	0.63	16.0	2.00	50.8	0.16	4.1	10					

Table 5 Type I, Class 2, Style A, Curved Jaw Without Cutter

Nominal Size	Overall Length, A		Height, B		Jaw Thickness, C		Handle Width, D		Minimum Handle Clearance, E		Jaw Angle, F, deg ±5	Minimum Jaw Opening Tip-to-Tip	
	In.	mm	In.	mm	In.	mm	In.	mm	In.	mm		In.	mm
	±0.63	±16	±0.38	±9.7	±0.10	±2.5	±0.38	±9.7					
5 1/2	5.5	139.7	1.56	39.6	0.25	6.4	1.50	38.1	0.09	2.3	10	1.13	28.7
7	7.0	177.8	2.00	50.8	0.28	7.1	1.88	47.8	0.16	4.1	10	1.50	38.1
8 1/2	8.5	215.9	2.63	66.8	0.38	9.7	2.00	50.8	0.16	4.1	10	1.88	47.8

GENERAL NOTE: See Fig. 2 for reference.

Table 6 Type I, Class 2, Style B, Curved Jaw With Cutter

Nominal Size	Overall Length, A		Height, B		Jaw Thickness, C		Handle Width, D		Minimum Handle Clearance, E		Jaw Angle, F, deg ±5	Minimum Jaw Opening Tip-to-Tip	
	In.	mm	In.	mm	In.	mm	In.	mm	In.	mm		In.	mm
	±0.63	±16	±0.38	±9.7	±0.10	±2.5	±0.38	±9.7					
4 1/4	4.25	108	1.31	33.3	0.19	4.8	1.31	33.3	0.09	2.3	10	1.00	25.4
5 1/2	5.50	139.7	1.56	39.6	0.25	6.4	1.50	38.1	0.09	2.3	10	1.13	28.7
7	7.00	177.8	2.00	50.8	0.28	7.1	1.88	47.8	0.16	4.1	10	1.50	38.1
8 1/2	8.50	215.9	2.63	66.8	0.38	9.7	2.00	50.8	0.16	4.1	10	1.88	47.8

GENERAL NOTE: See Fig. 2 for reference.

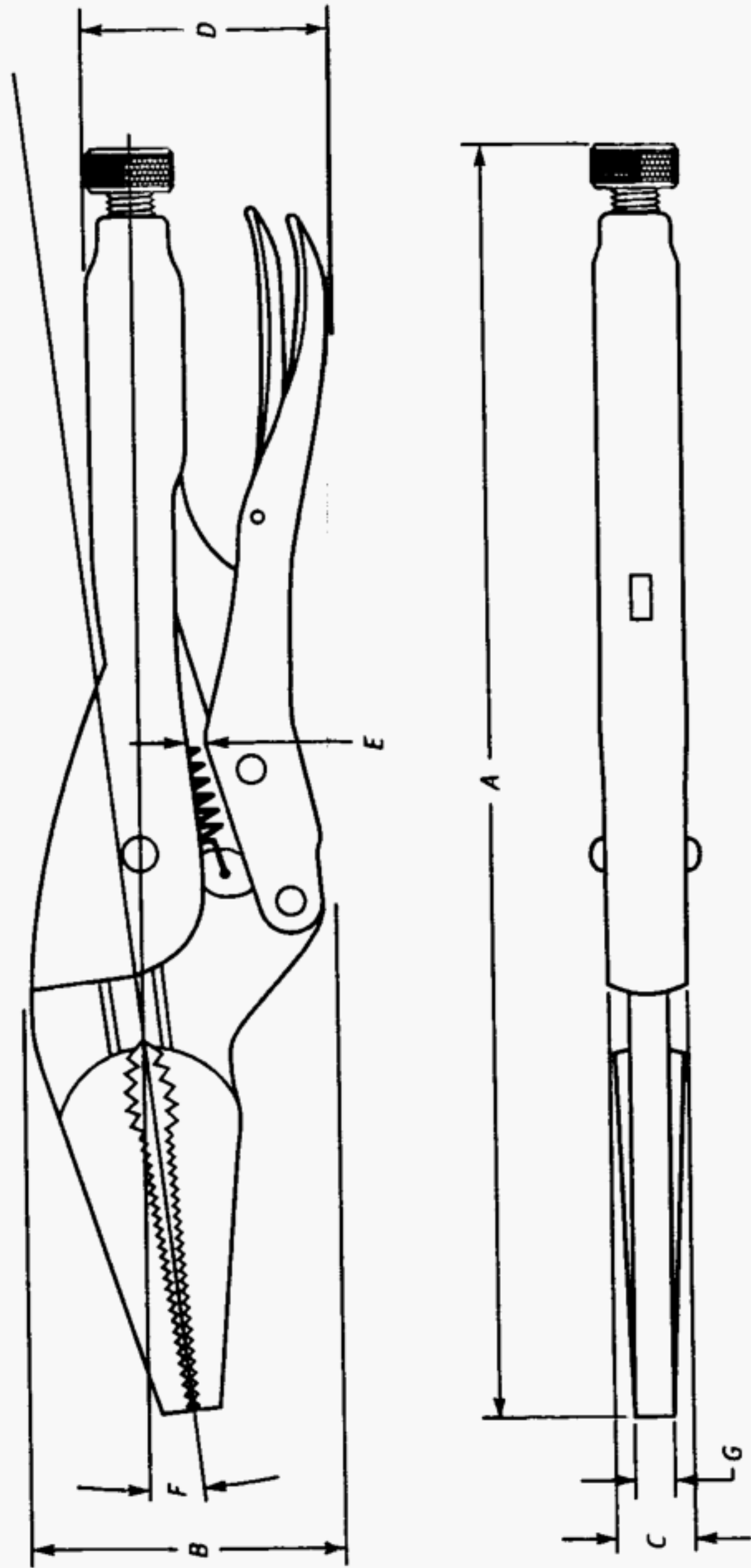


Table 7 Type I, Class 3, Styles A and B, Long Nose With and Without Cutter

Nominal Size	Overall Length, A		Height, B		Minimum Jaw Thickness, C		Handle Width, D		Minimum Handle Clearance, E		Jaw Angle, F, deg	Tip Width, G		Jaw Opening Tip-to-Tip			
	In.	mm	In.	mm	In.	mm	In.	mm	In.	mm		In.	mm	In.	mm		
5 1/4	133	5.25	133.4	±0.25	1.31	33.3	0.41	10.4	1.31	33.3	0.09	2.3	10	0.13	3.3	1.50	38.1
6 1/2	165	6.50	165.1	±0.25	1.56	39.6	0.47	11.9	1.50	38.1	0.09	2.3	10	0.16	4.1	2.00	50.8
8 1/2	216	8.50	215.9	±0.25	2.00	50.8	0.56	14.2	1.88	47.8	0.16	4.1	10	0.19	4.8	2.75	69.9

GENERAL NOTE: Style B shown in figure.

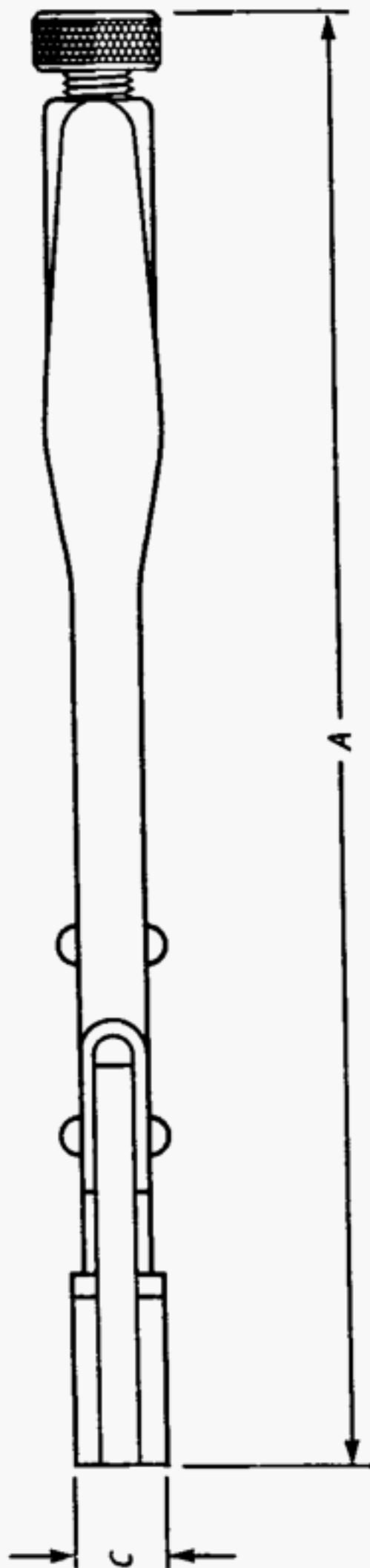
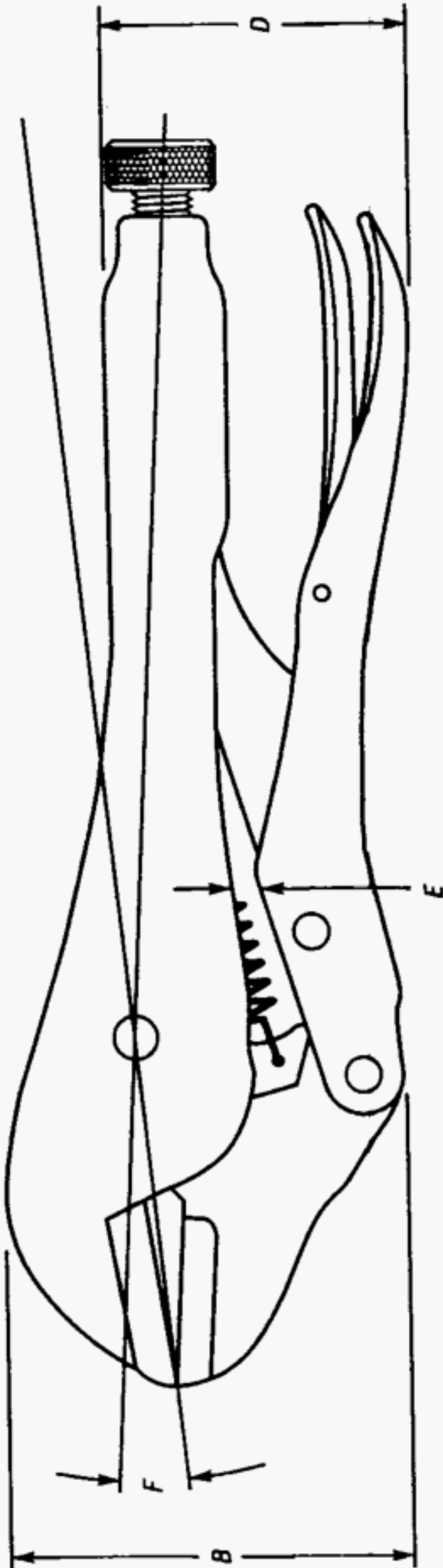


Table 8 Type I, Class 4, Style A, Smooth Jaw Without Cutter

Nominal Size	Overall Length, A		Height, B		Jaw Thickness, C		Handle Width, D		Minimum Handle Clearance, E		Jaw Angle, F, deg	Minimum Jaw Opening Tip-to-Tip		Jaw Opening at Parallel Position	
	In.	mm	In.	mm	In.	mm	In.	mm	In.	mm	±5	In.	mm	In.	mm
5 1/2	±0.63	16	1.56	39.6	0.44	11.2	1.50	38.1	0.09	2.3	10	1.13	28.7	0.38	9.7
7	±0.63	16	2.25	57.2	0.44	11.2	1.88	47.8	0.16	4.1	10	1.31	33.3	0.56	14.2
8 1/2	±0.63	16	2.63	66.8	0.63	16.0	2.00	50.8	0.16	4.1	10	1.75	44.5	0.63	16.0

from 30 lbf (133 N) to 35 lbf (155 N) shall be applied to lock the toggle mechanism.

The free ends of the brass shall then be secured in a test apparatus. When the pull is applied to the free ends, slippage shall not occur prior to an applied load of 155 lbf (690 N).

5.2.5 Jaw Clearance Test, Class 2. Test shall be performed in the deepest part of the jaw arc using the go/no-go criteria in Table 3. Pliers shall be in the closed and locked position. This test shall be performed after test specified in para. 5.2.4(a).

6 TYPE, CLASS, AND STYLE PROVISIONS

6.1 Type I Locking Pliers

Adjustments in the jaw opening shall be made by the adjusting screw. Pliers shall have straight, curved, long nose or bent nose jaws. Pliers shall be capable of withstanding the locking test specified in para. 5.2.3. Pliers shall have one fixed jaw and one adjustable jaw. The jaws shall be integral with or securely fixed to the pliers. There shall be no motion of the gripping surface of either jaw other than that produced by manual operation of the pliers.

6.1.1 Class 1, Straight Jaws. The gripping surface of Class 1 jaws shall be serrated with sharp teeth of such form as to securely hold work object with a positive grip. Pliers shall be capable of withstanding the grip test of para. 5.2.4(a). Style A pliers shall have two straight jaws and conform to the requirements shown in Table 4 for the size specified and shall be similar to the illustration in Table 4.

6.1.2 Class 2, Curved Jaws. Class 2 pliers shall have straight, serrated gripping surfaces at the outer end of the jaws suitable for gripping flat surfaces, and curved gripping jaws with sharp teeth at the center of the jaw suitable for gripping round surfaces. Pliers shall be capable of withstanding the grip test of para. 5.2.4(a).

(a) *Style A, Without Cutter.* Style A pliers shall conform to the requirements shown in Table 5 for the size specified and shall be similar to Fig. 2.

(b) *Style B, With Cutter.* Style B pliers shall be identical to Style A pliers except that the pliers shall be provided with cutting edges near the joint. Pliers shall cut wire in accordance with para. 5.2.2. Pliers shall conform to the requirements shown in Table 6 for the sizes specified and shall be similar to Fig. 2.

6.1.3 Class 3, Long Nose

(a) *Style A, Without Cutter.* Pliers shall have straight, serrated gripping surfaces at the outer end of the jaws suitable for gripping flat surfaces. The balance of the gripping surfaces may be straight or with curved gripping jaws with sharp teeth at the center of the jaw suitable for gripping round surfaces. Class 3, Style A pliers shall conform to the requirements shown in Table 7 and shall be similar to the illustration in Table 7.

(b) *Style B, With Cutter.* Pliers shall have straight, serrated gripping surfaces at the outer end of the jaws suitable for gripping flat surfaces. The balance of the gripping surfaces may be straight or with curved gripping jaws with sharp teeth at the center of the jaw suitable for gripping round surfaces and shall be provided with cutting edges near the joint end. Pliers shall cut wire, as specified in para. 5.2.2. Class 3, Style B pliers shall conform to the requirements shown in Table 7 and be similar to the illustration in Table 7.

6.1.4 Class 4, Smooth Jaw. Class 4 pliers shall have smooth jaw surfaces and shall be capable of holding, without marring the surface, parallel-sided material of a thickness up to the minimum jaw opening size. Pliers shall conform to the requirements shown in Table 8 and shall be similar to the illustration in Table 8. Pliers shall be capable of withstanding the grip tests of para. 5.2.4(c).

7 DESIGNATIONS

Purchasers should select the preferred options permitted herein, and include the following information in procurement documents:

- (a) title, number, and date of this Standard;
- (b) type, class, and style of pliers required;
- (c) size of pliers required; and
- (d) the type of coating required.

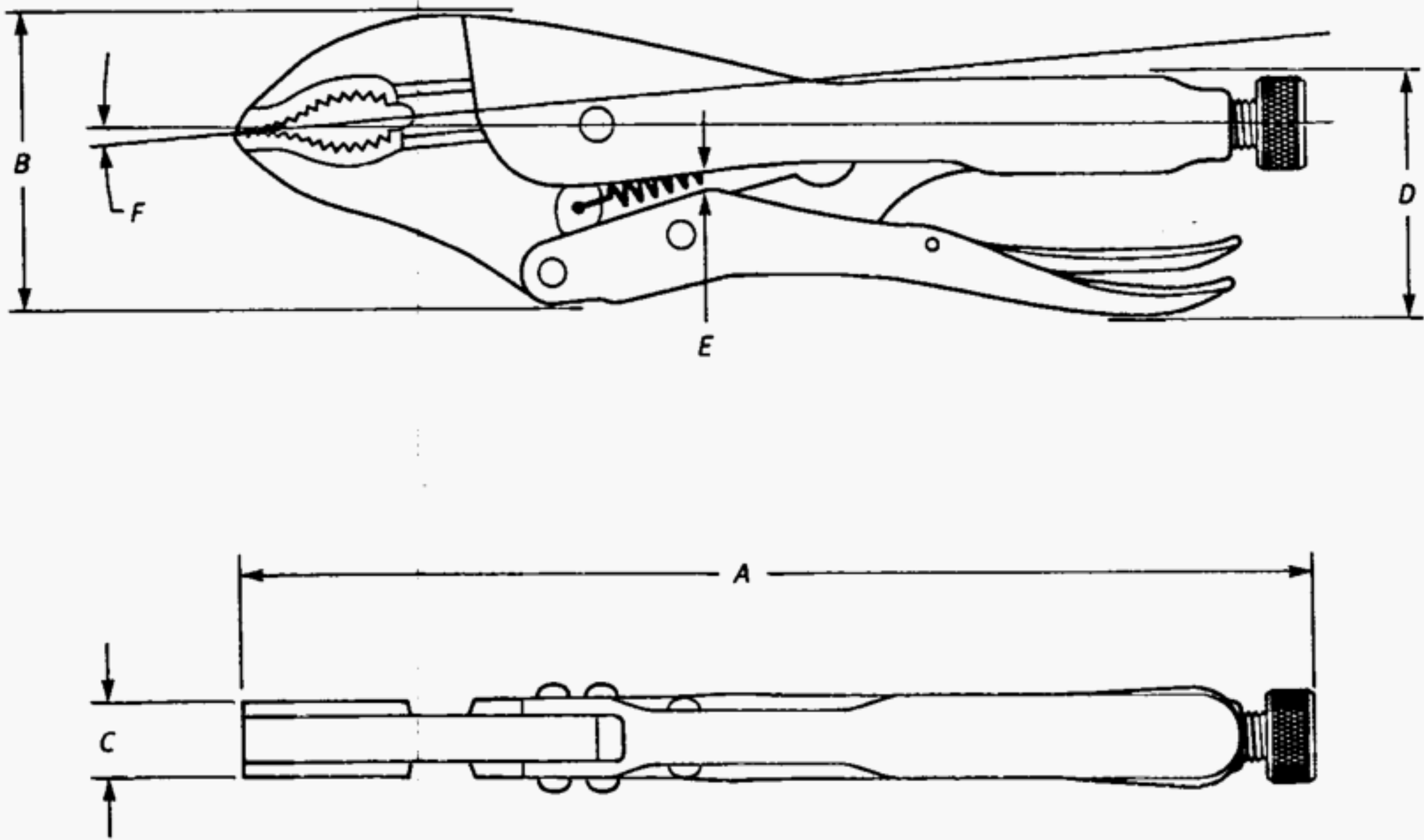


Fig. 2 Type I, Class 2, Styles A and B, Curved Jaw Without and With Cutter (Style B Shown)