



Designation: D7142 – 05 (Reapproved 2021)

## Standard Test Method for Holding Strength of Prong-Ring Attached Snap Fasteners<sup>1</sup>

This standard is issued under the fixed designation D7142; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1 This test method covers the determination of the holding strength of a prong-ring to the socket or stud of a snap fastener using a tensile testing machine (Option 1) or a manual test stand and force-measuring gage (Option 2).

1.2 This test method is applicable to prong-ring type snap fasteners in garments or to be attached to fabrics intended for use in apparel (see [Annex A1](#)).

1.3 The values stated in either SI units or inch-pound units are to be regarded separately as standard. Within the text, the inch-pound units are shown in parentheses. The values stated in each system are not exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

### 2. Referenced Documents

#### 2.1 ASTM Standards:<sup>2</sup>

[D76/D76M Specification for Tensile Testing Machines for Textiles](#)

[D123 Terminology Relating to Textiles](#)

[D1776/D1776M Practice for Conditioning and Testing Textiles](#)

#### 2.2 Federal Document:

[16 CFR Parts 1500.48-1500.53 and 1501.4 Engineering Test Manual for Children's Toys](#)<sup>3</sup>

### 3. Terminology

#### 3.1 Definitions:

3.1.1 *force, n*—a physical influence exerted by one body on another which produces acceleration of bodies that are free to move and deformation of bodies that are not free to move.

3.1.2 *holding strength, n*—in snap fasteners, the force required to separate the prong-ring from its attached mating part (socket or stud).

3.1.2.1 *Discussion*—In this test method, a diametric force is applied which simulates the diametric biting or pinching of a child; however, in practice, the disengaging force used to unsnap a snap fastener is usually applied at the edge of the fastener.

3.1.3 *prong-ring type fastener, n*—generic name for snap fasteners which use a multi-pronged ring to penetrate through fabric to mechanically set a matching socket on one side of a closure and to set a matching stud on the facing closure allowing the outer and inner closure facings to be snapped together. (See [Fig. 1](#).)

3.1.4 *socket, n*—in snap fasteners, the female functional part of the fastener which engages with the stud part of the fastener to form the closure of two parts of the item on which the fastener is used. (See [Fig. 1](#).)

3.1.4.1 *Discussion*—Prong-ring attached socket or stud snap fasteners are designed to be mechanically attached to garments or other items through the deformation interaction of the prong-ring with the socket or stud. Other forms of snap fasteners exist which may be attached to the foundation of the garment or other item by means of sewn threads or adhesive bonding.

3.1.5 *strength, n*—the property of a material that resists deformation induced by external forces.

3.1.5.1 *Discussion*—In this standard, the deformation is the separation of the prong-ring from the socket or stud of a snap fastener.

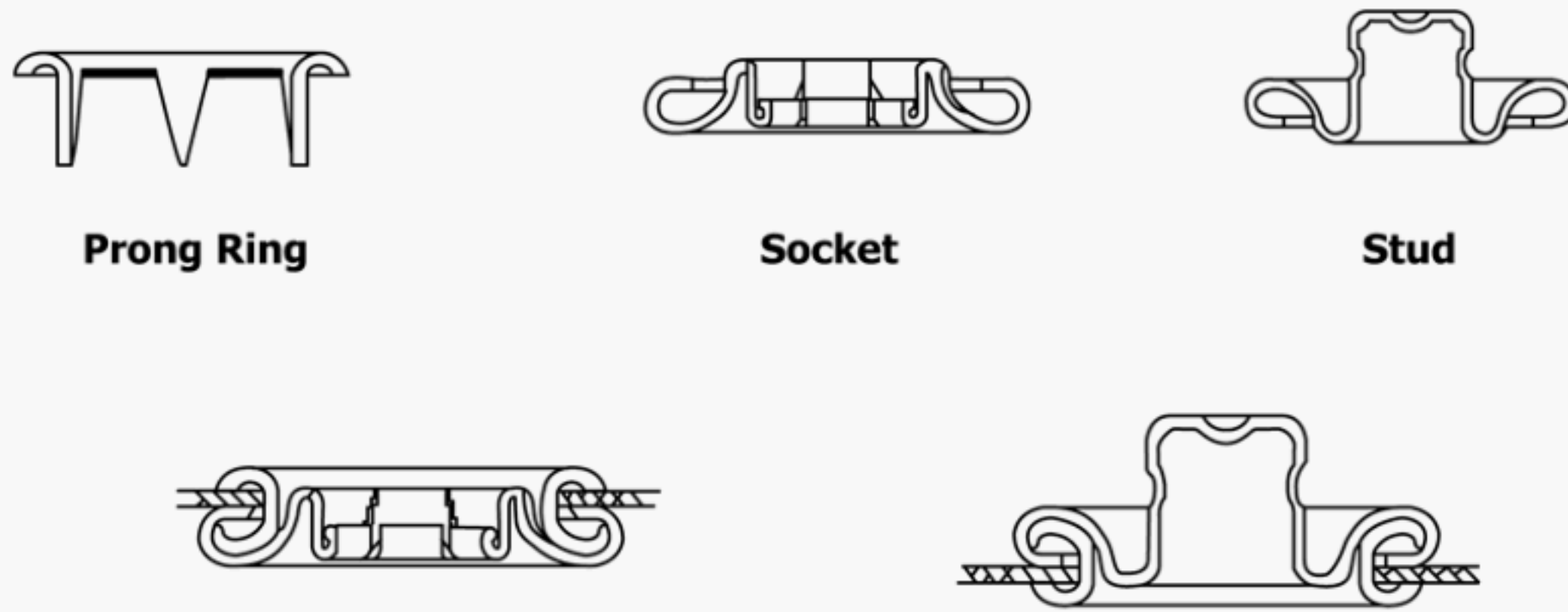
<sup>1</sup> This test method is under the jurisdiction of ASTM Committee [D13](#) on Textiles and is the direct responsibility of Subcommittee [D13.54](#) on Subassemblies.

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>3</sup> Available from Federal Register, Vol 44, No. 117, June 1979, Consumer Product Commission, 16 CFR Parts 1500 and 1501.





**Prong Ring Attached to socket or stud**

**FIG. 1 Prong-ring Attached Fastener Parts**

3.1.6 *stud, n*—in snap fasteners, the male functional part of a snap fastener which engages with, or snaps into, the mouth of the socket to form a closure of two parts of the item, or garment on which the fastener is used. (See Fig. 1.)

3.1.6.1 *Discussion*—See discussion for socket.

3.1.7 For definitions of other textile terms used in this standard, refer to Terminology D123.

#### 4. Summary of Test Method

4.1 *Option 1*—A specimen, consisting of a fastener socket or stud attached to fabric by a prong-ring, is mounted in a special test fixture on a tensile testing machine. A force is applied diametrically until the prong-ring separates from the socket or stud, or the fabric is torn. The force at separation is reported as the holding strength. If the fabric tears, the force at fabric failure is recorded and the data is reported and it is considered as a different category and is reported separate from the holding strength of the fasteners.

4.2 *Option 2*—A specimen, consisting of a fastener socket or stud attached to fabric by a prong-ring, is mounted in a special test fixture on a manual pull test stand which is fitted with a portable force gage. A force is applied until the prong-ring separates from the socket or stud, or the fabric is torn. The force at separation is reported as the holding strength. If the fabric tears, the force at fabric failure is recorded and the data is reported and it is considered as a different category and is reported separate from the holding strength of the fasteners.

#### 5. Significance and Use

5.1 Both test methods are considered satisfactory for acceptance testing of commercial shipments of garments with prong-ring type snap fasteners.

5.1.1 In case of dispute arising from differences in reported test results when using this test method for acceptance of commercial shipment, the purchaser and the supplier should conduct comparative tests to determine if there is a statistical bias between their laboratories. Competent statistical assistance is recommended for the investigation of bias. As a minimum, the two parties should take a group of test speci-

mens that are as homogeneous as possible and that are from a lot of material of the type in question. The test specimens should then be randomly assigned in equal numbers to each laboratory for testing. The average results from the two laboratories should be compared using appropriate statistical analysis and an acceptable probability level chosen by the parties before testing is begun. If a bias is found, either the cause must be determined and corrected, or the purchaser and supplier must agree to interpret future test results with consideration to the known bias.

5.2 Comparison of results from test equipment operating on different principles is not recommended. In cases of conflict between the test results achieved with manual test equipment (Option 2) and motorized CRE (constant rate of extension) tensile testing machine (Option 1), the results from the motorized equipment shall take precedence.

5.3 This test method may be used to determine the compatibility of prong-ring type snap fasteners and fabrics for use in apparel. In which case, the fasteners are attached to the fabric in the manner in which they will be used and the combined units tested. See Annex A1.

#### 6. Apparatus

##### 6.1 For Option 1:

6.1.1 Tensile Testing Machine, CRE type, meeting Specification D76/D76M. (See Figs. 2 and 3.)

6.1.2 Upper Snap Fixture Attachment 4, Fig. 4, designed to diametrically attach to the socket or stud of the snap fastener, which is attached to the fabric specimen or garment being tested.

6.1.3 Lower Snap Fixture Attachment 4, Fig. 4, designed to secure the fabric and thereby the socket or stud attached to it in a horizontal plane.

##### 6.2 For Option 2:

6.2.1 Force Measuring Gage 5, modified with an attachment to be fastened on to the upper arm of a test stand with the upper test fixture suspended from it. (See Fig. 3.)



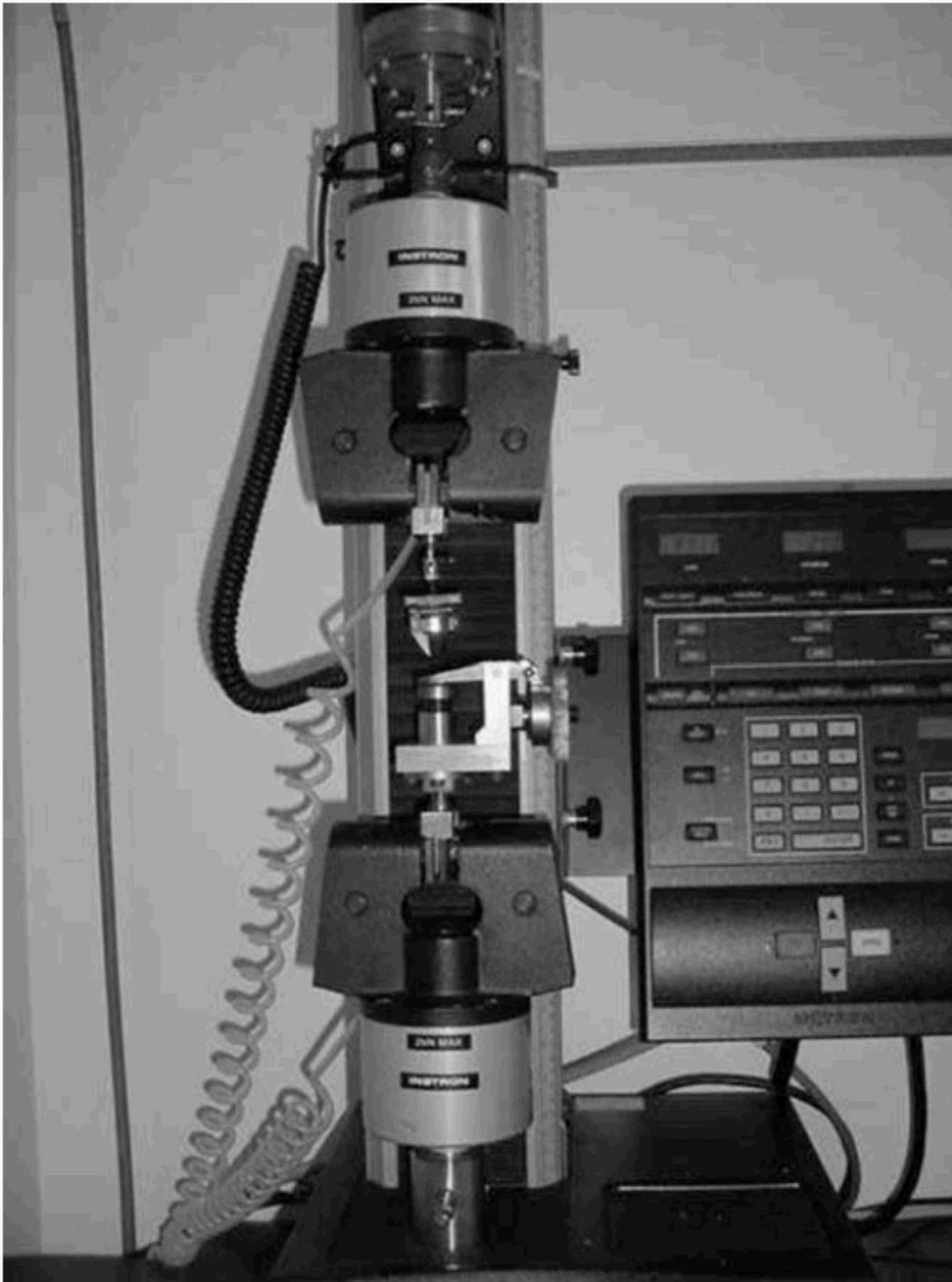


FIG. 2 CRE-Type Tensile Testing Machine Setup with Test Fixtures For Option 1

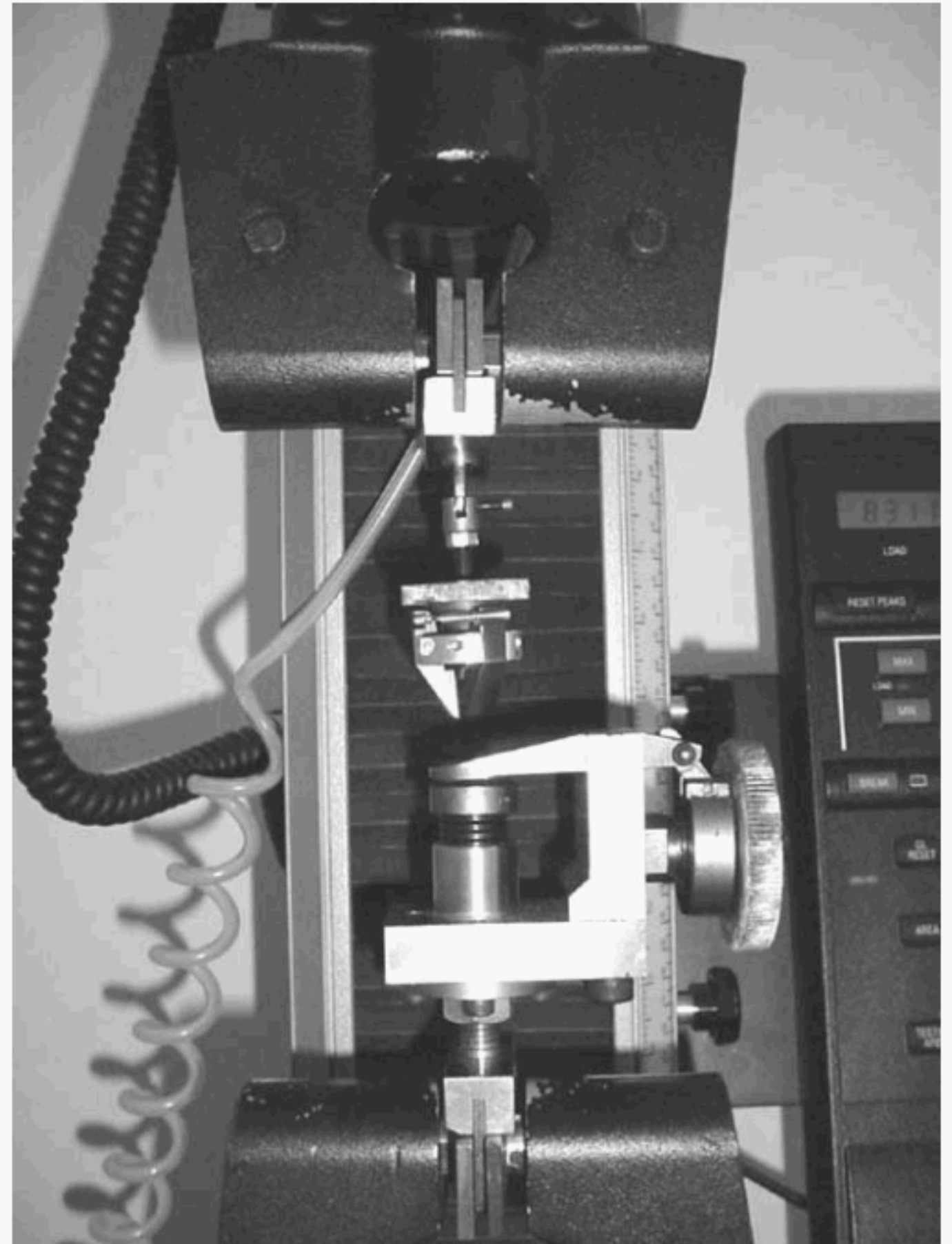


FIG. 3 Closeup of CRE-Type Tensile Testing Machine Fixture Setup

6.2.2 Upper Snap Fixture Attachment 4, Fig. 4, designed to diametrically attach to the socket or stud of the snap fastener which is attached to the fabric specimen or garment being tested.

6.2.3 Lower Snap Fixture Attachment 4, Fig. 4, designed to secure the fabric and thereby the socket or stud attached to it in a horizontal plane.

6.2.4 Test Stand, see Fig. 5.

## 7. Sampling

### 7.1 Lot Sample:

7.1.1 For acceptance testing, randomly select the number of shipping cartons or other containers of garments as directed in an applicable material specification, contract or other agreement between the purchaser and the supplier. Consider the cartons or containers to be the primary sampling units.

NOTE 1—An adequate specification or other agreement between the purchaser and the supplier requires taking into account the variability between shipping units, between sampling units within a shipping unit and between specimens to provide a sampling with a meaningful producer's risk, consumer's risk, acceptable quality level and limiting quality level.

### 7.2 Laboratory Sample:

7.2.1 For acceptance testing, take one garment from each lot sampling unit provided that it has ten snap fasteners. If the garment contains fewer than ten snap fasteners, take a number

of garments from each laboratory sampling unit to obtain the ten snap fasteners. If garment has snaps attached to multiple locations; that is, collar, shoulder, placket, front, crotch, leg cuff, and the like, take appropriate number of garments that will provide ten snaps per location.

### 7.3 Test Specimens:

7.3.1 Test ten specimens from each garment. A test specimen consists of the assembled prong-ring, fabric and a socket or a stud. The locations of the specimens must allow for secure clamping in the fixtures. Specimens need not be cut from the garment provided that the garment does not interfere with the test.

## 8. Preparation of Apparatus

### 8.1 For Option 1:

#### 8.1.1 Preparation:

8.1.1.1 Set up and verify the tensile testing machine according to the manufacturer's instructions and 8.1.1.2 – 8.1.1.4.

8.1.1.2 Attach the upper and lower snap fixtures to the testing machine and check the alignment. (See Figs. 2 and 3.)

8.1.1.3 Select a force range for separation to occur between 10 % and 90 % of full scale force.

8.1.1.4 Set the loading rate for 300 mm/min  $\pm$  10 mm/min (12.0 in./min  $\pm$  0.5 in./min).



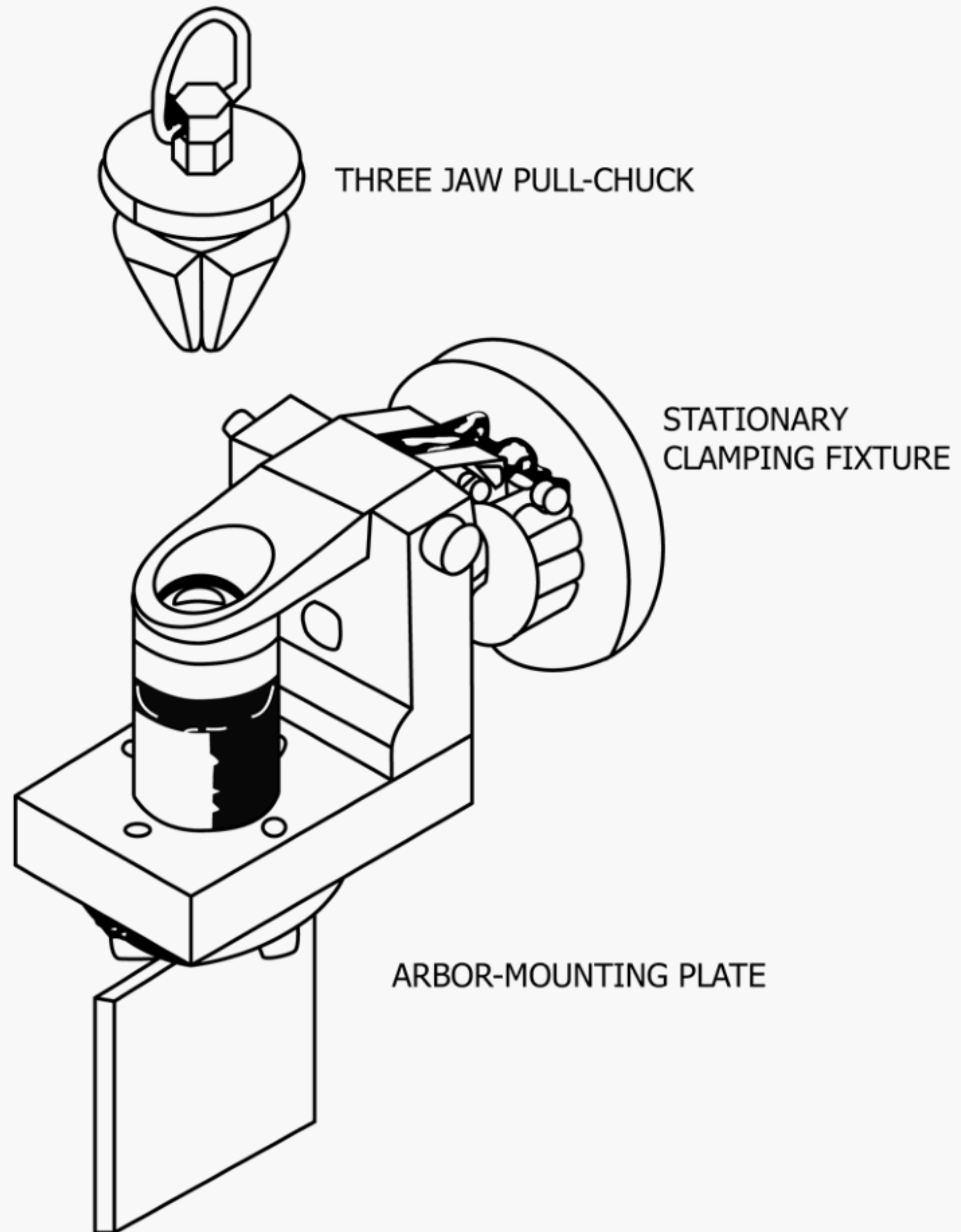


FIG. 4 Upper and Lower Snap Clamping Fixtures

#### 8.1.2 Total Operating System:

8.1.2.1 Verify the operating system (loading, extension, clamping, and recording or data collecting) by testing standard specimens of snap fasteners and fabrics for holding strength as directed in Section 10.

8.1.2.2 Maintain a record of the data.

#### 8.2 For Option 2:

##### 8.2.1 Preparation:

8.2.1.1 Setup the manual test stand and verify the force reading of the force gage according to the manufacturer's instructions and 8.2.1.2 – 8.2.1.4.

8.2.1.2 Attach the upper fixture to the force gage and the lower fixture to the table of the manual testing stand and check their alignment. (See Fig. 5.)

8.2.1.3 Select and adjust the control switches of the force gage.



FIG. 5 Manual Testing Apparatus

8.2.1.4 Adjust the distance between the upper and lower test fixture to allow clearance for the setup of the test specimen.

#### 8.2.2 Total Operating System:

8.2.2.1 Verify the operating system (loading, extension, clamping, and recording or data collecting) by testing setup specimens of snap fasteners and fabrics for holding strength as directed in Section 10 and Annex A1.3.

8.2.2.2 Maintain a record of the data.

### 9. Conditioning

9.1 Condition the specimens by bringing them from the dry side to approximate moisture equilibrium for testing in the standard atmosphere for testing textiles as directed in Practice D1776/D1776M.

### 10. Procedure

#### 10.1 Option 1:

10.1.1 Position prong-ring of the specimen in the lower snap clamping fixture and ensure that it is flat and centered in the fixture. Tighten the clamping fixture on the specimen.

10.1.2 Position the upper clamping fixture for the jaws to fit over the perimeter edge of the socket or stud of the specimen. Turn the adjustment screw until the jaws make contact with the fastener. Do not include any loose fabric in the jaws. Be careful that the upper fixture does not affect the structural integrity of the fastener when tightening the fixture onto the fastener.

10.1.3 Initiate the test by applying force to the machine until the prong-ring disengages from the fastener or the fabric tears.



10.1.4 Record the force to disengage the prong-ring from the fastener as the holding force to the nearest 0.1 N (0.5 lbf). If the fabric tears before the fastener and prong-ring disengage, record the specimen as failing. The value of the fabric specimen failure is recorded separate from the recording of the values of the fastener holding strength.

#### 10.2 Option 2:

10.2.1 Position prong-ring of the specimen in the lower snap clamping fixture and ensure that it is flat and centered in the fixture. Tighten the clamping fixture on the specimen with the socket or stud facing up.

10.2.2 Position the upper clamping fixture for the jaws to fit over the perimeter edge of the socket or stud of the specimen. Turn the adjustment screw until the jaws make contact with the fastener. Do not include any loose fabric in the jaws. Be careful that the upper fixture does not affect the structural integrity of the fastener.

10.2.3 Apply a force of 3 pounds per second until the fastener disengages from its prong-ring or the fabric tears. Or apply specified tensile force and hold for specified time as agreed upon by purchaser and seller of snap.

10.2.4 Record the force to separate the prong-ring from the socket or stud fastener part as the holding strength to the nearest 0.1 N (0.5 lbf). If the fabric tears before the prong ring separates from the socket or stud, record the specimen as failing. The value of the fabric specimen failure is recorded separate from the recording of the values of the fastener holding strength.

## 11. Report

11.1 State that the specimens were tested as directed in Test Method D7142. Describe the material or product sampled and the method of sampling used. Include in the material or product description the size of prong-ring snap fastener, the type of fabric, the style of the garment and the location of the fastener on the garment (collar, shoulder, placket, front, crotch, leg cuff, and the like).

11.2 Report the following information:

11.2.1 The individual values of force to separate the fastener from the fabric, and the average holding strength for each laboratory sampling unit and for the lot.

11.2.2 The number of specimens that failed (fabric tears) along with their individual values.

## 12. Precision and Bias

12.1 *Precision*<sup>4</sup>—An interlaboratory test was conducted in 2003.

12.2 The value for holding strength of prong-ring to socket or stud of snap fasteners in garments can only be defined by a test method. Within this limitation, Test Method D7142 has no limitations.

## 13. Keywords

13.1 fabric; fastener; prong-ring; fastener; snap; garments; strength; holding

<sup>4</sup> Supporting data have been filed at ASTM International Headquarters and may be obtained by requesting Research Report RR:D13-1120.

# ANNEX

## (Mandatory Information)

### A1. SELECTION OF PRONG-RING SNAP FASTENERS FOR USE IN GARMENTS

#### A1.1 Prong-ring Snap Fastener and Fabric

A1.1.1 *Prong-ring Snap Fastener*—Size appropriate to the type of fabric to be used in the garment. Two or more sizes may need to be tested to obtain acceptable data.

A1.1.2 *Fabric*—For which the particular prong-ring type fastener is being assessed for suitability.

A1.1.3 *Interliner Fabric*—As needed in garment construction and snap fastener use.

#### A1.2 Number of Specimens

A1.2.1 Test five prong-ring snap fasteners of each size to be tested.

#### A1.3 Preparation of Setup Specimens

A1.3.1 Cut 100 mm by 600 mm (4 in. by 24 in.) strips of the fabric. If an interliner is to be in the area of the garment in

which the snap fastener is to be used, cut strips of interliner which are half the width of the fabric strips. Fold the strip lengthwise, with or without interliner as needed.

A1.3.2 Attach five sockets and five studs to the folded strip using prong-rings and the manufacturer's instructions.

#### A1.4 Testing

A1.4.1 Test the specimens as directed in Section 10

#### A1.5 Report

A1.5.1 Report the applicable information as stated in Section 12.



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