

NOTE: MIL-STD-293 has been redesignated as a Test Method Standard. The cover page has been changed for Administrative reasons. There are no other changes to this Document.

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DEPARTMENT OF DEFENSE  
TEST METHOD  
VISUAL INSPECTION GUIDE  
FOR  
CELLULAR RUBBER ITEMS



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18 October 1956

OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE  
WASHINGTON 25, D. C.

Supply and Logistics

VISUAL INSPECTION GUIDE FOR CELLULAR RUBBER ITEMS

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1. This standard has been approved by the Department of Defense and is mandatory for use by the Departments of the Army, the Navy, and the Air Force, effective immediately.
2. In accordance with established procedure, the Standardization Division has designated the Ordnance Corps, the Bureau of Ships, and the Air Force, respectively, as the Army-Navy-Air Force custodians of this standard.
3. Recommended corrections, additions, or deletions should be addressed to the Standardization Division, Office of the Assistant Secretary of Defense (Supply and Logistics), Washington 25, D. C.

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6. Concavity—not a defect
7. Cover stock missing, sealing surface—major; nonsealing surface—minor
8. Cover stock missing, under  $\frac{1}{16}$  inch—minor
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10. Crack, sealing surface—major; nonsealing surface—minor
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32. Surface dirt, slight amount—minor
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35. Hard spot—major
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42. Edge tear—major
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45. Surface void—major
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47. Plugged core holes—acceptable
48. Punched core holes—acceptable
49. Froth repair—acceptable
50. Insert repair—acceptable
51. Resurfaced repair—acceptable
52. Section repair—acceptable
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54. Tear repair—acceptable

## FOREWORD

Government material procurement specifications have been primarily concerned with detailing composition, construction and necessary physical requirements. However, little attention has been paid to defining the limits of acceptable quality regarding manufacturing defects other than such generalizations as "the workmanship shall be first class." In such a diverse industry as that of rubber manufacturing, individual plants vary considerably in their production and quality control technique. Defects are likely to occur from many causes such as variation in the quality of the basic materials and variations in manufacturing processes and finishing operations. Therefore, the quality generalizations used in this document must of necessity cover a considerable range which represents the best available judgment. This document is issued as a practical yardstick which inspectors will use to appraise visually the quality of cellular rubber items.

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**1. SCOPE AND PURPOSE**

**1.1 Scope.** This document covers only visual defects for "sponge" rubber items. These include chemically blown or expanded rubber items having either open and interconnecting cells or closed and noninterconnecting cells. Also included are cellular products made from chemically or mechanically foamed latices or liquid elastomers.

**1.2 Purpose.** The primary objective of this document is to present word descriptions and photographs of possible defects in cellular rubber items that may be presented for inspection. In addition it provides a training aid for inspectors.

**1.2.1** In general this document is not intended to take the place of a particular inspection procedure aid which may be provided for inspectors to verify conformance with a particular specification. The quality requirements specified in the basic specification are governing.

**2. REFERENCED DOCUMENTS****2.1 Standards**

## MILITARY

MIL-STD-105 Sampling procedures and Tables for Inspection by Attributes

MIL-STD-177 Rubber Products, Terms for Visible Defects of

(Copies of specifications, standards, drawings, and publications required by contractors in connection with specific procurement functions should be obtained from the procuring agency or as directed by the contracting officer.)

**3. DEFINITIONS**

**3.1** Categories, major and minor defects, are as defined in Standard MIL-STD-105.

**3.2** Word descriptions of visible defects used in this standard are in accordance with Standard MIL-STD-177.

**4. GENERAL**

**4.1** The classification of visual defects for cellular rubber items is more complex than for a single-shape, single-application item such as V-belts. Cellular rubber goods are produced

in a nearly infinite variety of sizes and shapes so that there is no common or typical shape for this class of item. Also, these items have several principal end uses or service requirements which are dissimilar in the amount of perfection or quality required. These include the following:

*a. Flexing.* A critical use where the item undergoes constant or intermittent bending, twisting or deflecting during service such as a vibration isolation material.

*b. Sealing.* A critical use where the item serves as an airtight or watertight closure such as a gasket.

*c. Protecting.* An intermediate use where the item serves as a covering material and physical stress is not existent or occurs infrequently, such as rug underlay.

*d. Filling.* A noncritical use where the item serves merely as an internal space filler and physical stress is not existent or occurs infrequently, as an insulation material.

A cellular rubber item may, and frequently does, have two or more of these service requirements in combination.

**4.2** It is recognized that the rejection of an inspection lot of cellular rubber items for flaws which are not commensurate with the dimensional tolerances or degree of quality required by the user can result in an appreciable increase in the cost of production. In some instances the enforcement of very high standards could result in an appreciable decrease in the volume of production. Accordingly, some of the visual defects in this guide are classified under three categories (major, minor, or acceptable) depending on the type of service requirement.

**4.3** Since the classification of certain visual defects depends on the service requirements of the item, it is imperative that the end use be known before inspection is started. In the majority of cases, the end uses will be apparent or can be readily determined from the procurement document. However, in case of doubt, the cognizant technical bureau or agency (on primes) or the endorsing inspection service (on subs) should be requested to supply this information.

**4.4** The following flaws may be allowed, provided they are corrected as indicated and

the resulting product conforms to the requirements of the procurement document:

a. Tears occurring during removal from mold, carefully cemented together.

b. Small voids corrected by addition of material of identical composition and quality as that of the base item and finishing to a level, neat appearing surface.

c. Increasing the compression resistance by the addition of material of identical composition and quality as that of the base item to the core holes in a symmetrical pattern throughout the product to produce the required uniform compression resistance. (See fig. 47.)

d. Decreasing the compression resistance by the removal of material in a symmetrical pattern throughout the product to produce the

required uniform compression resistance. (See fig. 48.)

e. Assembled products where the finished item required is larger than it is feasible to mold in one section.

f. Hand built shapes where the order is small and/or the nature of the shape is such as to make molding uneconomical.

Some acceptable examples of the above described conditions are illustrated in figures 46 through 54.

4.5 For the convenience of presentation in table 1, the defects are grouped into two types by method of manufacture, namely (A) chemically blown and (B) latex foam. While a number of the defects are peculiar to the individual type, some of them are common to both types.

TABLE I—Defects classification

Defect	Major	Minor	Figure number
A—Chemically Blown			
Blister, on sealing surface, proportionally larger than shown or more than two of size shown per foot of cord.	X		1.
Blister, on nonsealing surface, no larger proportionally than shown, or no more than two of size shown per foot of cord.		X	1.
Blowhole (internal void). See blowhole under latex foam.			
Check, calendar	Not a defect		2.
Check, cold, sealing surface	X		3.
Nonsealing surface		X	3.
Nonsealing and nonvisible surface	Not a defect		3.
Check, heavy stock, sealing surface	X		4.
Nonsealing surface, greater than amount shown	X		4.
Nonsealing surface, no more than amount shown	Not a defect		4.
Check, light stock, sealing surface, no more than amount shown		X	5.
Nonsealing surface, no more than amount shown	Not a defect		5.
Concavity (die cut), no greater than shown	Not a defect		6.
Cover stock missing, sealing surface	X		7.
Nonsealing surface		X	7.
Cover stock missing (open mold), if under $\frac{1}{16}$ inch, that is, if it will seal closed in service.		X	8.
Crack	X		9.
Crack, sealing surface	X		10.
Nonsealing surface		X	10.
Distortion (deformation). See distortion under latex foam.			
Fill, bad, molded item, below dimensional tolerance	X		11.
Fill, poor, molded item, sealing surface 13	X		13.
Nonsealing surface 12, 14, 15, 16		X	12, 14, 15, 16.
Fill, poor, strip	X		17.
Fill, poor, strip, no greater than $\frac{1}{8}$ inch wide and $\frac{1}{16}$ inch deep		X	18.
Foreign material (wood, metal, etc.), over $\frac{1}{8}$ inch (any dimension)	X		Not shown.
Hard spot, lump of unblown material over $\frac{1}{4}$ inch (any dimension)	X		Not shown.

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TABLE I—*Defects classification*—Continued

Defect	Major	Minor	Figure number
A—Chemically Blown—Continued			
Hard spot, lump of unblown material, $\frac{1}{8}$ inch to $\frac{1}{4}$ inch (any dimension).....		X	Not shown.
Missing material.....	X		19, 20 and 21.
Missing material, (dirty mold) sealing surface, more than 10 percent of area or more than $\frac{1}{32}$ inch deep.	X		22, 23 and 24.
Nonsealing surface no more than 20 percent of area or no more than $\frac{1}{16}$ inch deep.		X	22, 23 and 24.
Nonsealing surface, more than 20 percent of area or more than $\frac{1}{16}$ inch deep.	X		22, 23 and 24.
Porosity, no applied skin and no greater than shown.....	Not a defect		25.
Shrivel, no more than shown, sealing surface.....		X	26.
Nonsealing surface.....	Not a defect		26.
Splice, Bad.....	X		27.
Trapped air, sealing surface, more than 10 percent of area or more than $\frac{1}{32}$ inch deep.	X		28.
Nonsealing surface, no more than 20 percent of area or no more than $\frac{1}{16}$ inch deep.		X	28.
Nonsealing surface more than 20 percent of area or more than $\frac{1}{16}$ inch deep.	X		28.
Trapped air, surface marking only.....		X	29.
B—Latex Foam			
Blowhole (internal void other than core hole), large or showing surface recession.	X		30.
Small, no surface recession and compression resistance not appreciably changed.	Not a defect		Not shown.
Core area, low, over $\frac{1}{8}$ inch deep.....	X		31.
Under $\frac{1}{8}$ inch deep and dimensional tolerances met.....		X	Not shown.
Dirt, surface (entrapped foreign material), large particle which will be felt or seen through cover to be used.	X		Not shown.
Slight amount which will not be felt or seen through cover to be used.....		X	32.
Discoloration (surface stain), where will show through cover to be used.....	X		33.
Where will not show through cover to be used.....	Not a defect		33.
Distortion (deformation), exceeding dimensional tolerance.....	X		34.
Over $\frac{1}{8}$ inch but within dimensional tolerance.....		X	Not shown.
Hard spot (a lump of the basic material), large lump which will be felt through cover to be used.	X		35.
Small lump which will not be felt through cover to be used.....		X	Not shown.
Separation (an internal splitting or delamination).....	X		36.
Note: This is almost exclusively a large area defect so the minor defect does not occur.			
Shrinkage mark (pullaway or a definite recessed area on the top or side surface) over $\frac{1}{16}$ inch deep.	X		37.
Under $\frac{1}{16}$ inch deep and tapering gradually.....	Not a defect		Not shown.
See also core area, low.			
Skin, loose, greater than 2 inches in diameter or more than 2 percent of the surface area.	X		38.
1 to 2 inches long or $\frac{1}{2}$ to 2 percent of the surface area.....		X	Not shown.
Skin, tough (dense hide or greater density surface layer).....		X	39.
Skin, wrinkled, dimensional distortion.....	X		Not shown.
Shallow or fine surface wrinkles.....		X	40.

TABLE I—Defects classification—Continued

Defect	Major	Minor	Figure number
<b>B—Latex Foam—Continued</b>			
Sunburst (shallow surface voids) individual void over $\frac{1}{4}$ inch in width and depth.	X		41A.
Individual voids under $\frac{1}{4}$ inch in width and depth.....		X	41B.
Tear, edge, over 3 inches long or projecting more than $\frac{1}{4}$ inch into a plane.	X		42.
1 to 3 inches long or projecting $\frac{1}{8}$ inch to $\frac{1}{4}$ inch into a plane.....		X	Not shown.
Tear, surface (material missing), over $\frac{1}{16}$ inch deep.....	X		43.
Under $\frac{1}{16}$ inch deep and tapering gradually.....		X	Not shown.
Void, edge or corner, over 3 inches long or projecting more than $\frac{1}{4}$ inch into a plane.	X		44.
1 to 3 inches long or projecting $\frac{1}{8}$ inch to $\frac{1}{4}$ inch into a plane.....		X	Not shown.
Void, surface, over $\frac{1}{4}$ inch deep, or over $\frac{1}{16}$ inch deep and over $\frac{1}{4}$ inch wide.	X		45.
$\frac{1}{8}$ inch to $\frac{1}{4}$ inch deep, or $\frac{1}{16}$ inch to $\frac{1}{4}$ inch deep and up to $\frac{1}{4}$ inch wide.		X	Not shown

4.6 The following figures show examples of allowable repairs:

Buff, contour within dimensional tolerance.....	Figure 46
Core holes, plugged.....	47
Core holes, punched.....	48
Froth, a repair made with wet foam which is subsequently jelled, cured and dried.....	49
Insert.....	50
Resurfaced.....	51
Section.....	52 and 53
Tear.....	54

Copies of specifications, standards, drawings, and publications required by contractors in connection with specific procurement functions should be obtained from the procuring agency or as directed by the contracting officer.

Copies of this standard for military use may be obtained as indicated in the foreword to the Index of Military Specifications and Standards.

Copies of this Standard may be obtained for other than official use by individuals, firms, and

contractors from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

Both the title and the identifying symbol number should be stipulated when requesting copies of Military Standards.

Notice.—When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility, nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

Custodians:

Army—Ordnance Corps  
Navy—Bureau of Ships  
Air Force

Other interest:

Army—CEMQSigT  
Navy—AMCOY.

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FIGURE 1. —Blister, sealing surface—major; nonsealing surface—minor.

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FIGURE 2. —*Calendar check—not a defect.*

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FIGURE 3. —*Cold check, sealing surface—major; nonsealing surface—minor; nonsealing and nonvisible surface—not a defect.*



FIGURE 4. —*Heavy stock check, sealing surface—major; nonsealing surface—not a defect.*

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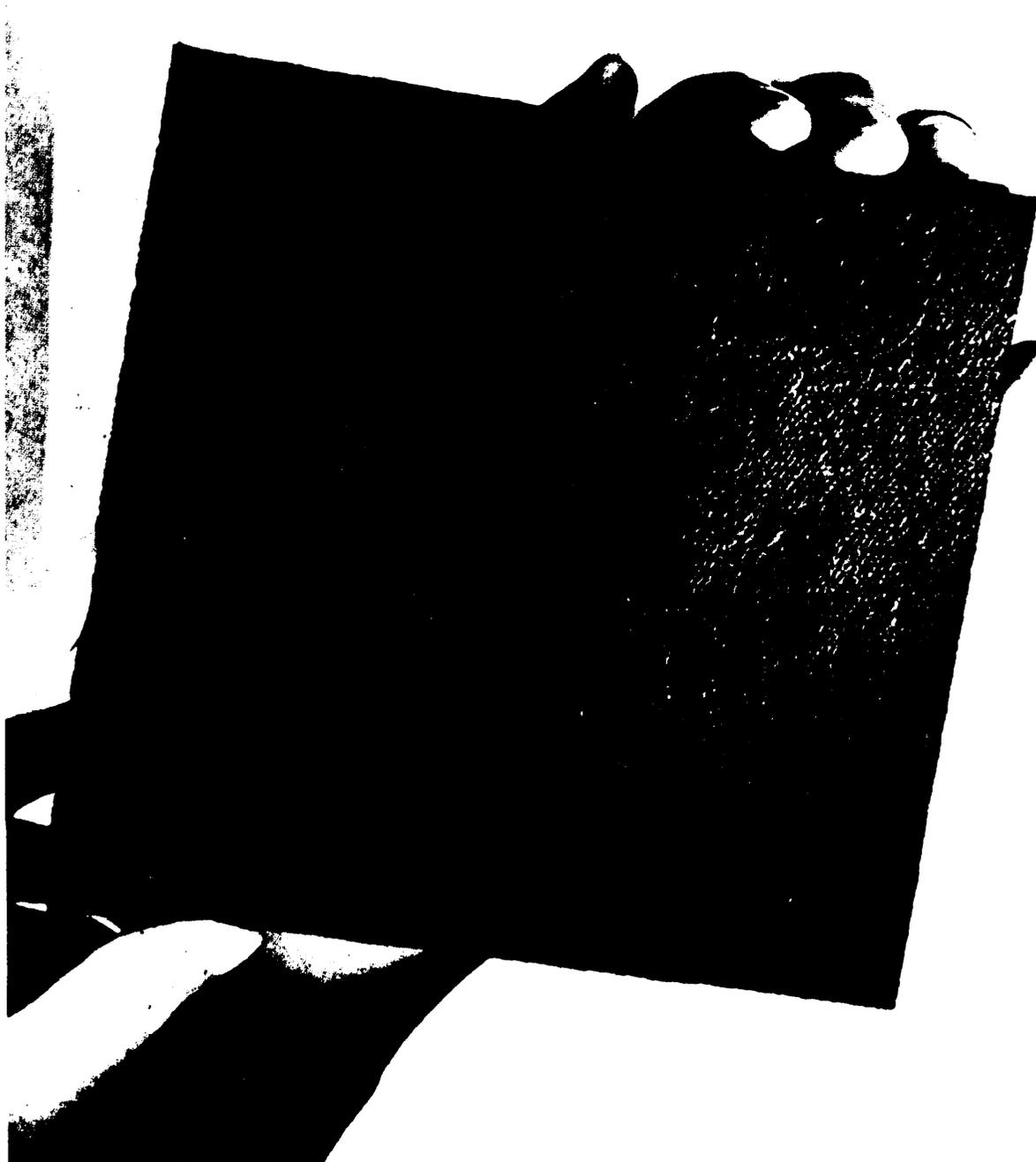


FIGURE 5. —*Light stock check, sealing surface—minor; nonsealing surface—not a defect.*

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FIGURE 6. —*Concavity—not a defect.*

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FIGURE 7. —Cover stock missing, sealing surface—major; nonsealing surface—minor.

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FIGURE 8. —Cover stock missing, under  $\frac{1}{16}$  inch— minor.

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FIGURE 9. —*Crack—major*

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FIGURE 10. —*Crack, sealing surface—major; nonsealing surface—minor.*

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FIGURE 11. —*Bad fill, below dimensional tolerance—major.*

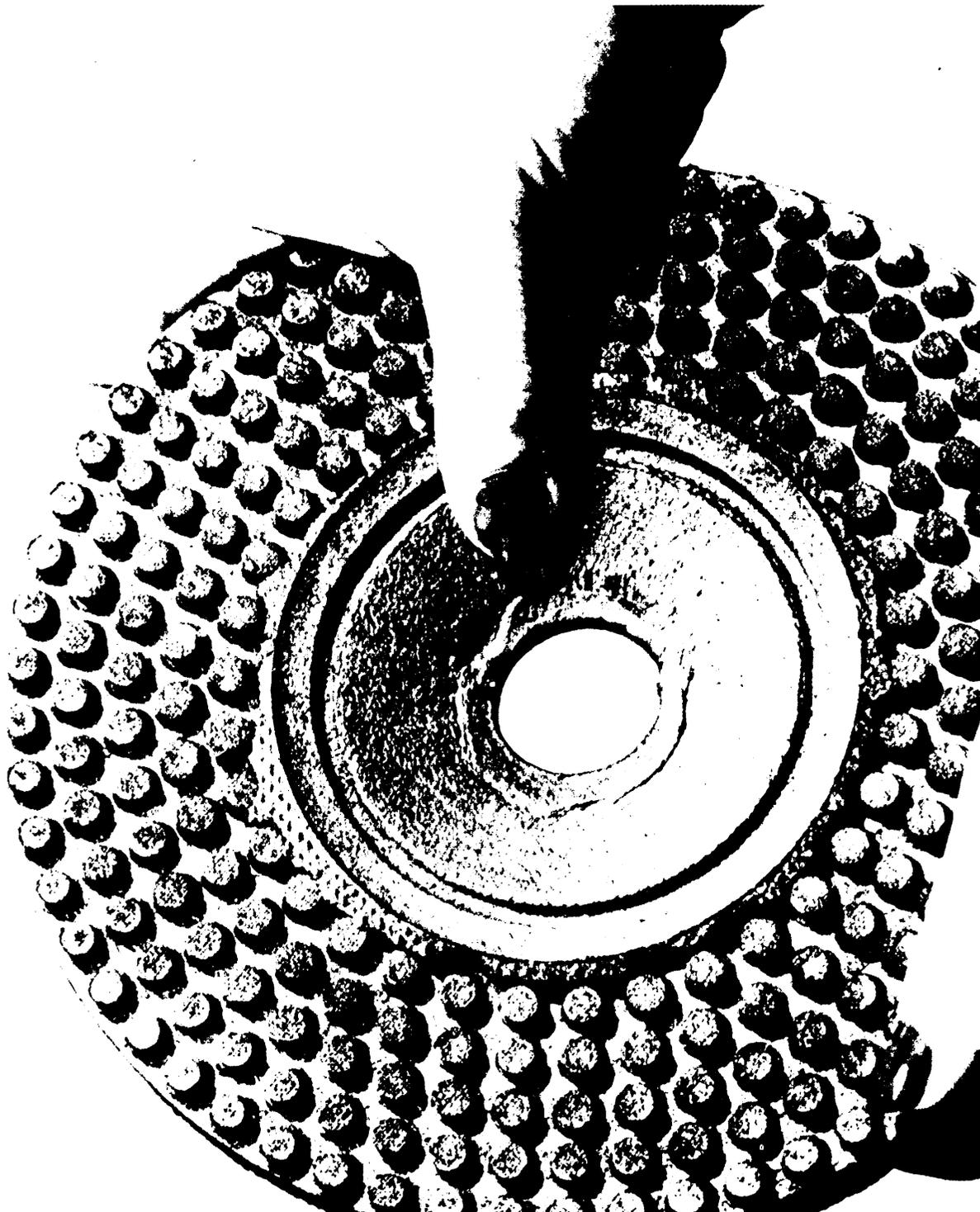


FIGURE 12. —*Poor fill, nonsealing surface—minor.*



FIGURE 13. —*Poor fill, sealing surface—major.*



FIGURE 14. —*Poor fill, nonsealing surface—minor.*

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FIGURE 15. —*Poor fill, nonsealing surface—minor.*



FIGURE 16. —*Poor fill, nonsealing surface—minor.*

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FIGURE 17. —*Poor fill—major.*

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FIGURE 18. —*Poor fill—minor.*

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FIGURE 19. —*Missing material—major.*

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FIGURE 20. —*Missing material—major.*

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FIGURE 21. —*Missing material—major.*

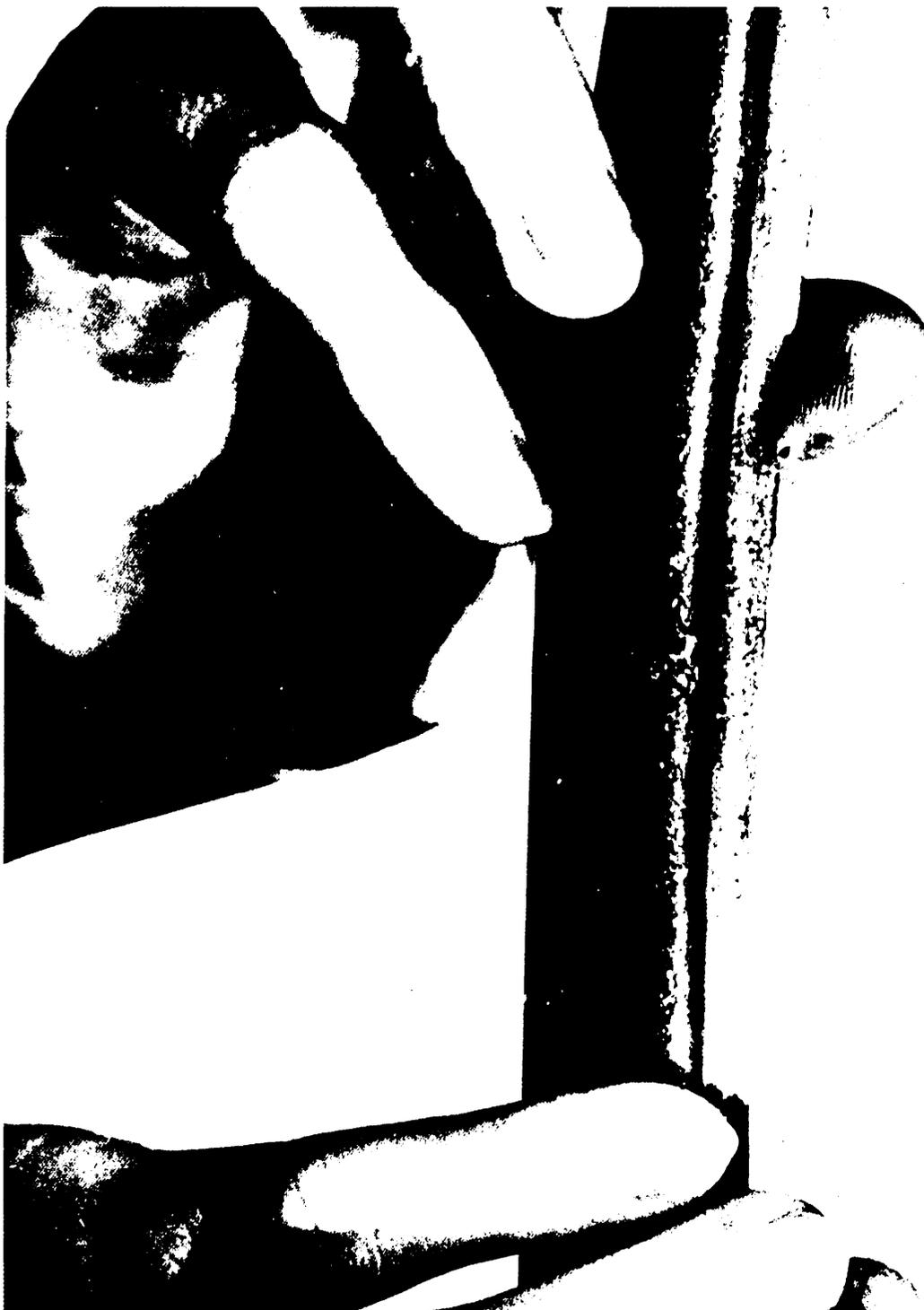


FIGURE 22. —*Missing material, sealing surface—major; nonsealing surface—minor.*

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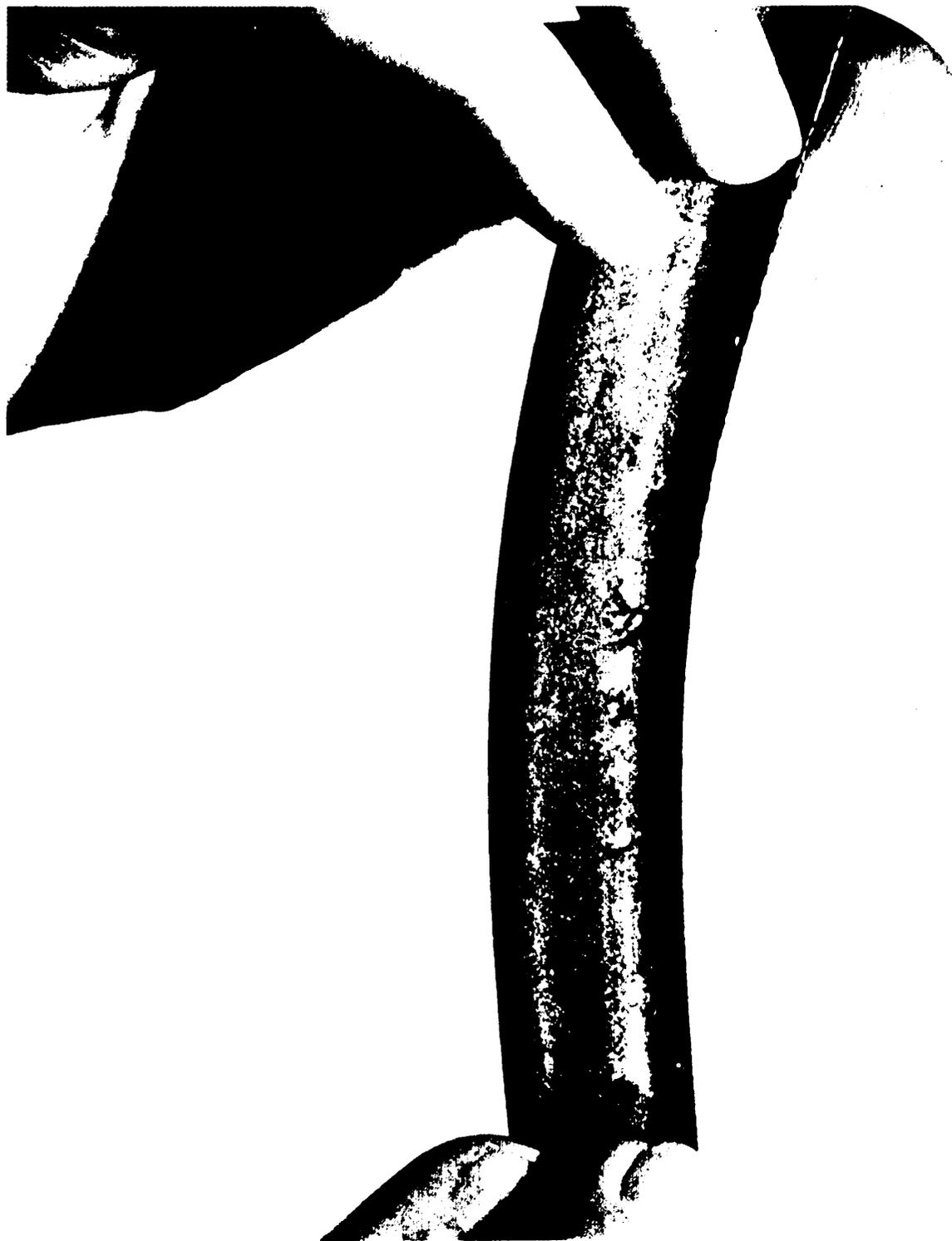


FIGURE 23. —*Missing material, sealing surface—major; nonsealing surface—minor.*



FIGURE 24. —*Missing material, sealing surface—major; nonsealing surface—minor.*

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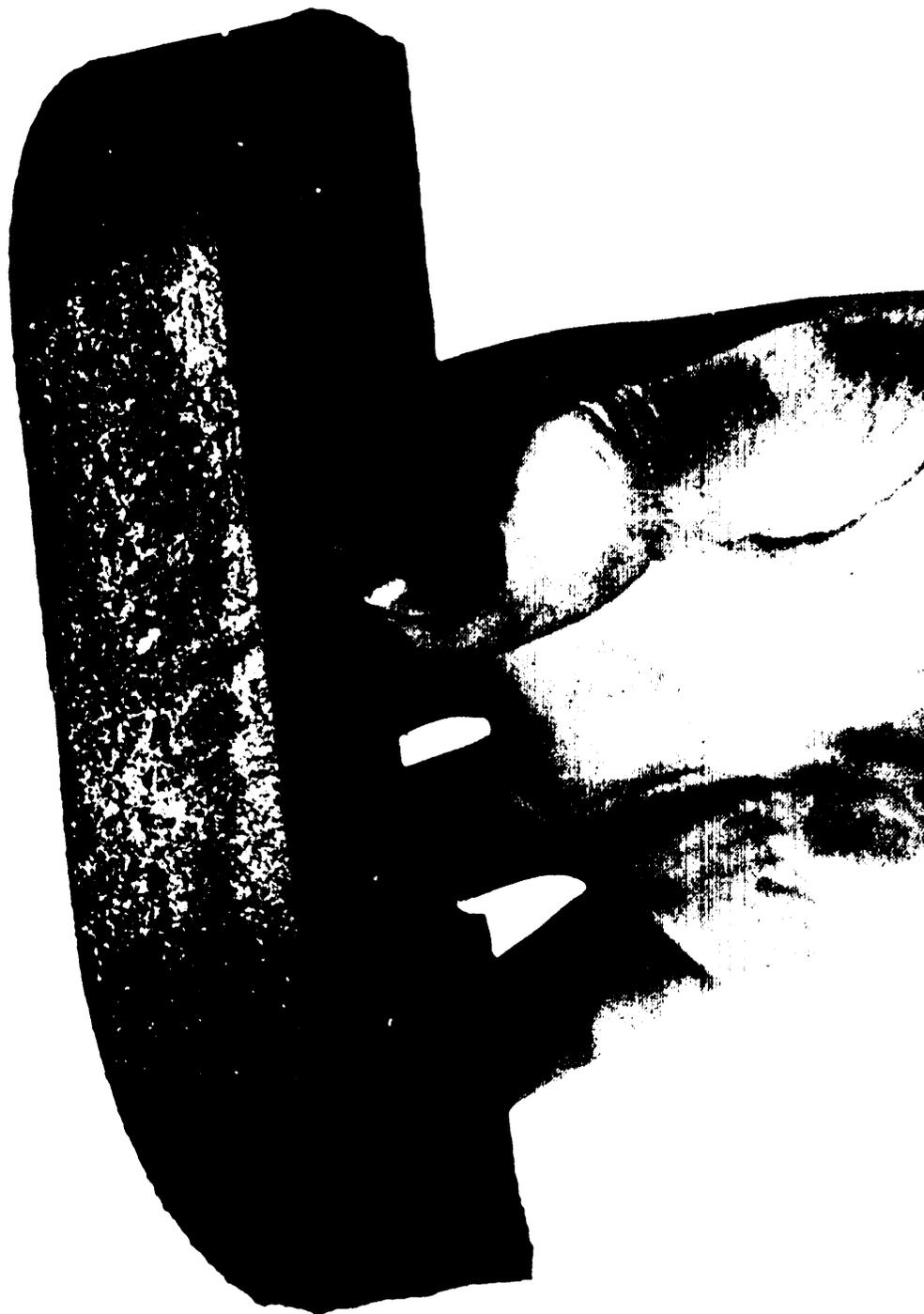


FIGURE 25. — *Porosity—not a defect.*



FIGURE 26. —*Shrivel, sealing surface—minor; nonsealing surface—not a defect.*

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FIGURE 27. —*Bad splice—major.*



FIGURE 28. —*Trapped air—major.*

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FIGURE 29. —*Trapped air—minor.*



FIGURE 30. —*Blowhole—major.*

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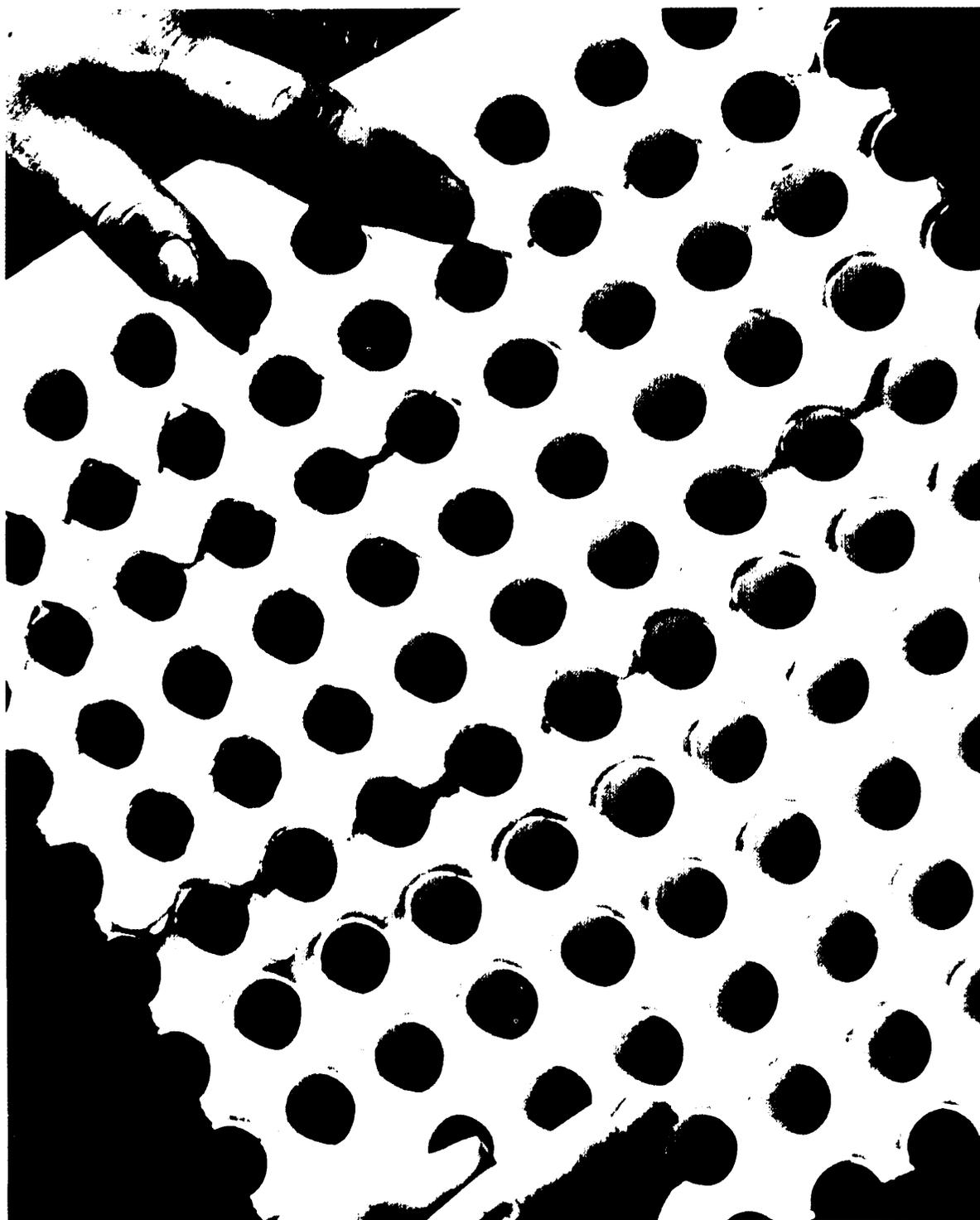


FIGURE 31. —*Low core area—major.*



FIGURE 32. —*Surface dirt, slight amount—minor.*

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FIGURE 33. —*Discoloration—will show through cover—major; will not show through cover—not a defect.*



FIGURE 34. —*Distortion large—major.*

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FIGURE 35. —*Hard spot—major.*

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FIGURE 36. —*Separation—major.*  
Note:—In order to show separation, the separated layer was cut and folded back

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FIGURE 37. —*Shrinkage mark—major.*

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FIGURE 38. —*Loose skin—major.*

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FIGURE 39. —*Tough skin—minor.*



FIGURE 40. —*Wrinkled skin—minor.*

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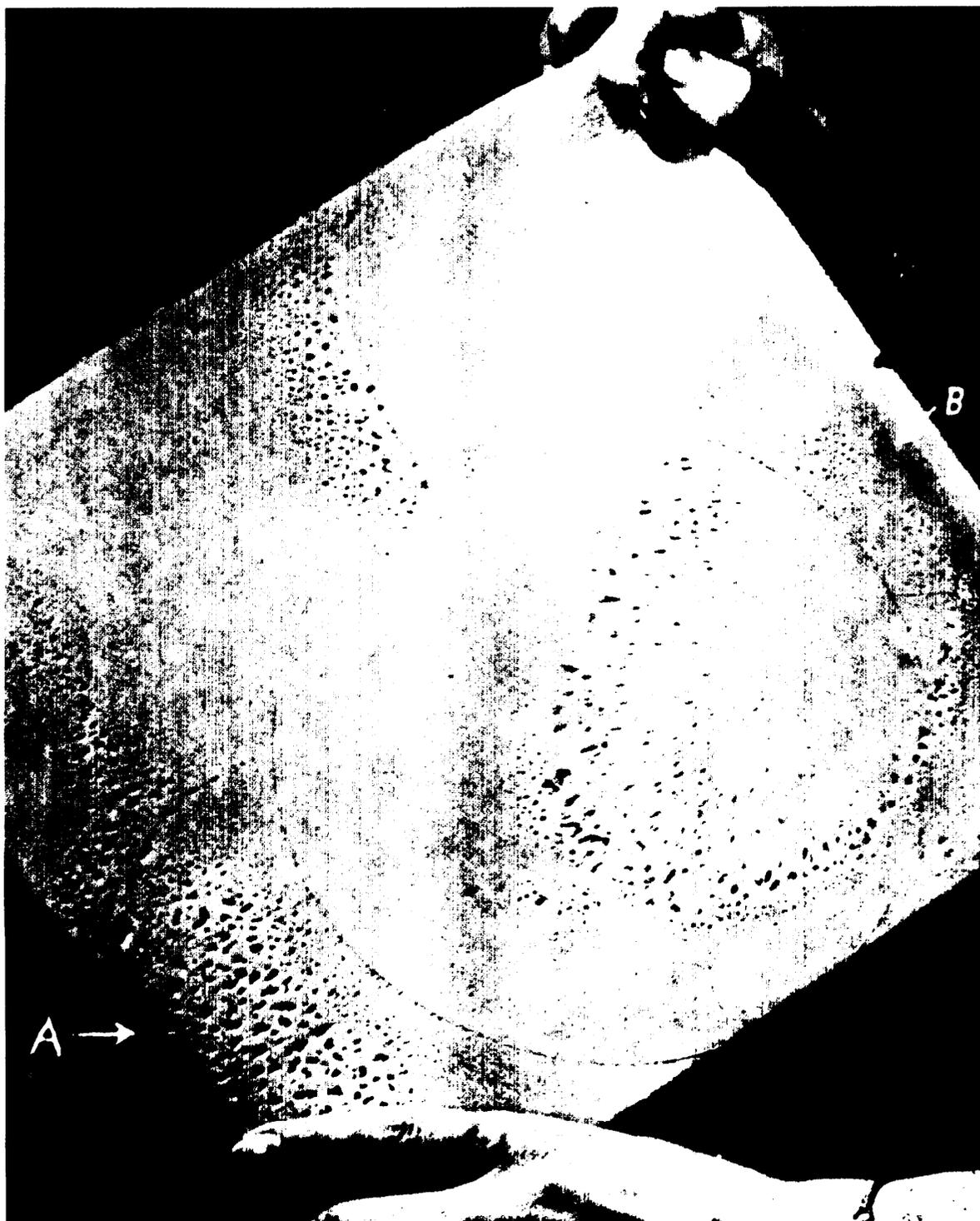


FIGURE 41. —Sunburst: A—major; B—minor.



FIGURE 42. —Edge tear—major.

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FIGURE 43. —Surface tear—major.

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FIGURE 44. —*Corner void—major.*

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FIGURE 45. —*Surface void—major.*



FIGURE 46. —*Buff repair—acceptable.*

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FIGURE 47. —*Plugged core holes—acceptable.*

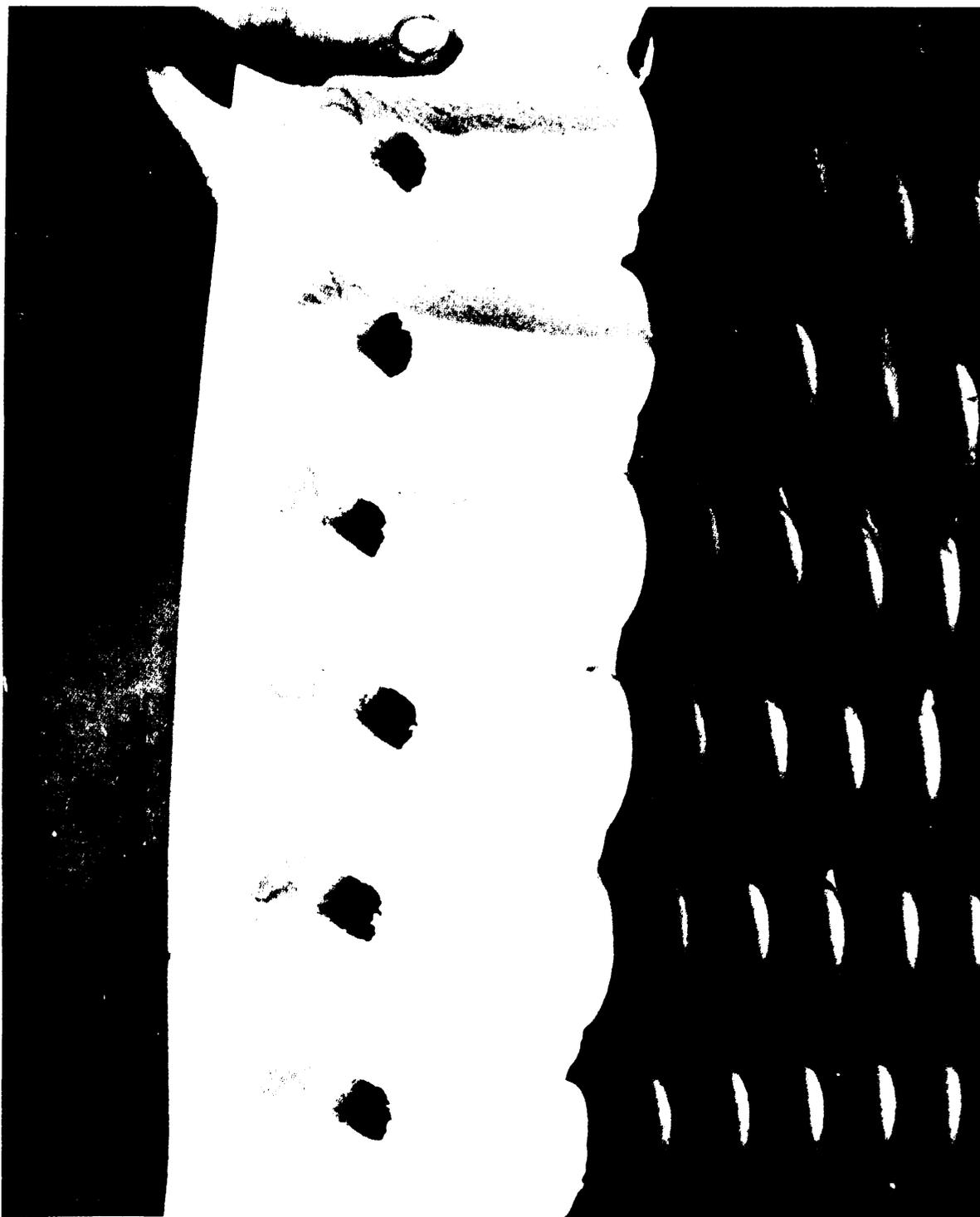


FIGURE 48. —*Punched core holes—acceptable.*

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FIGURE 49. —*Froth repair—acceptable.*



FIGURE 50. —*Insert repair—acceptable.*

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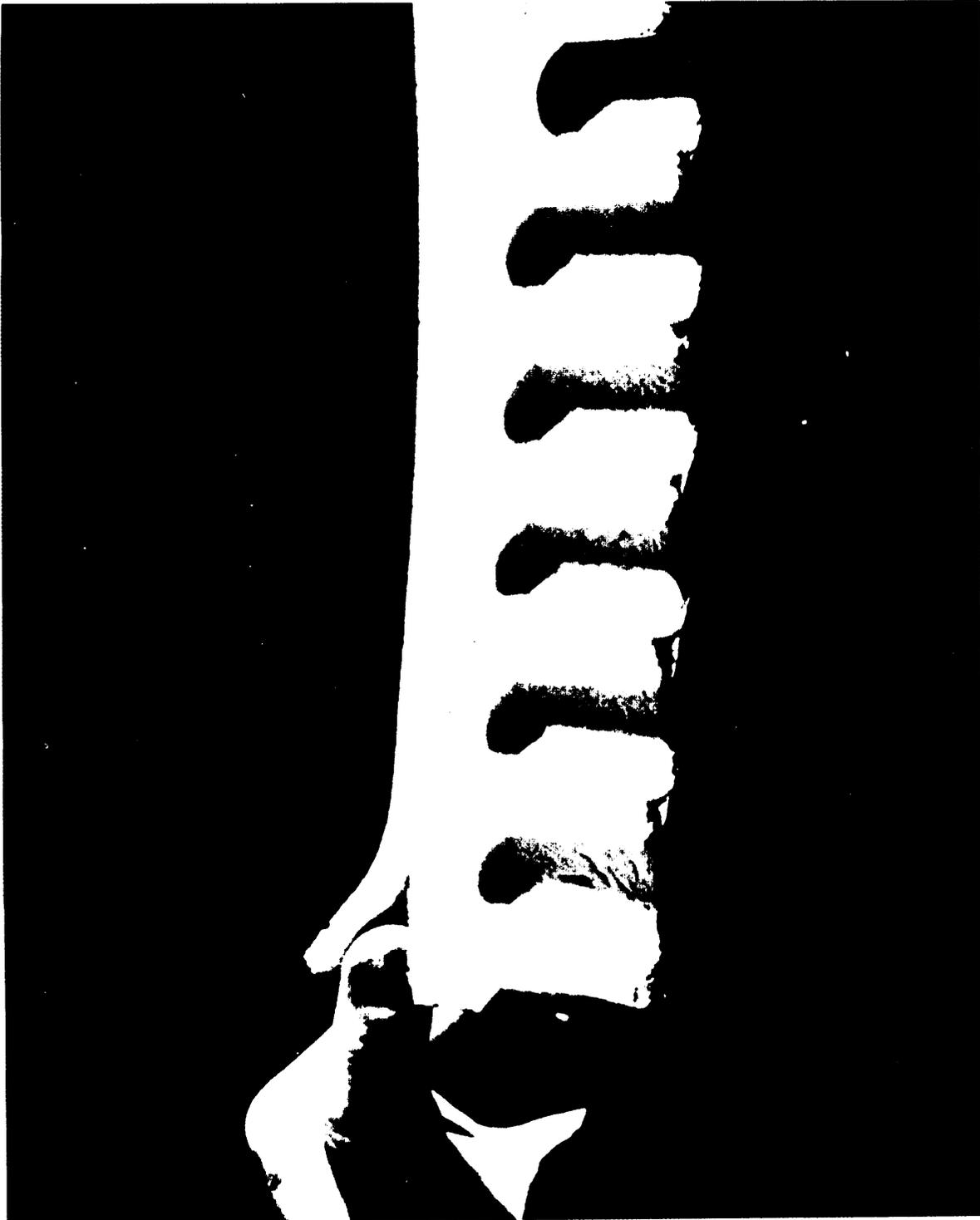


FIGURE 51. —*Resurfaced repair—acceptable.*

Note:—In order to show the repair, the resurfaced layer was separated at the corner, but, of course, to be acceptable there would be no delamination between layers.

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FIGURE 52. —*Section repair—acceptable.*

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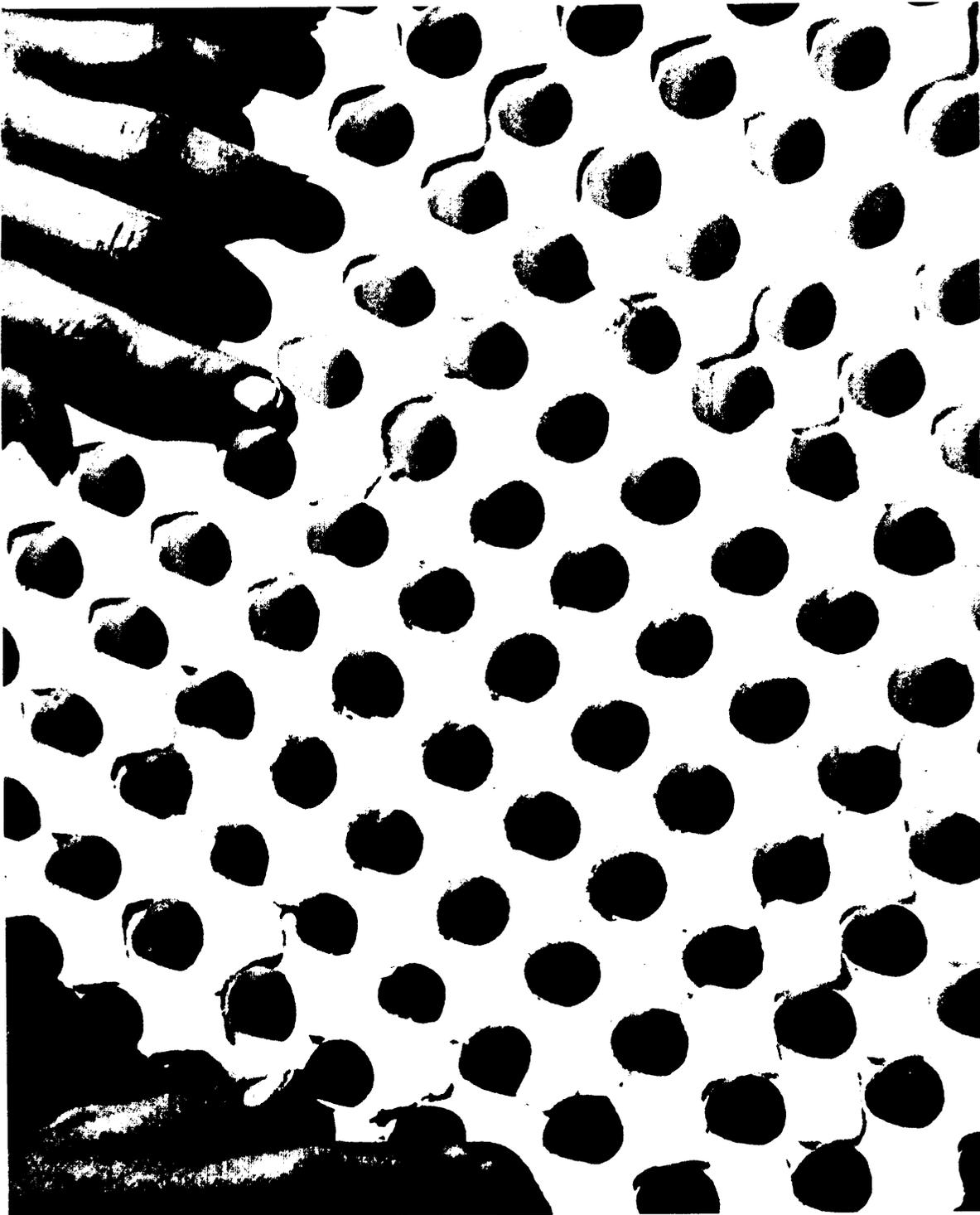


FIGURE 53. —Section repair—acceptable.

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FIGURE 54. —*Tear repair—acceptance*

