

Methods of sampling and physical testing of leather

Committees responsible for this British Standard

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- British Footwear Association
- British Leather Confederation
- Chief and Assistant Chief Fire Officers
- Consumer Policy Committee of BSI
- Furniture Industry Research Association (FIRA)
- Mail Order Traders' Association
- Ministry of Defence
- Royal Society for the Encouragement of Art
- SATRA Technology Centre
- Society of Leather Technologists and Chemists (SLTC)
- Trading Standards Institute

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Foreword

The 1959 edition of BS 3144 was based on the official test methods of the Society of Leather Trades' Chemists, and it was stated then that a revision would take place when agreement with the International Union of Leather Chemists' Societies had been reached. This agreement has now been arrived at in many cases, and the present revision is issued accordingly. The methods of the Society of Leather Trades' Chemists are identified in the introduction to the various test methods by the letters SLP, followed by a distinguishing number. Where agreement has been reached with the International Union, corresponding identification by the letters IUP, followed by a distinguishing number are also given.

Measurement in metric units is now specified in the majority of tests. More detailed instructions for location of the sample pieces are given, and three different sizes of sample for tensile testing are now included. The test for elongation of the sample at break has been omitted, as the other tensile tests are considered sufficient. The tear load test is carried out on a specimen having a shaped slot cut into it instead of a circular hole. The surface shrinkage measurement is applicable to all types of leather, and not restricted to certain types; this has been achieved by carrying out the soaking in a pressure vessel rather than at atmospheric pressure. The measurement of water absorption is carried out using the more sophisticated Kubelka apparatus, whereby the absorption by both volume and by weight can be measured.

The number of tests described has been considerably extended in this revision. Methods for the measurement of two-dimensional extension, set inlasting, flexing endurance, assessment of damage, scuff damage, shrinkage temperature, free water and percentage loss on soaking, waterproofness, and water vapour permeability are included for the first time. Dynamic waterproofness tests for boot and shoe leathers are also included.

At the end of several of the methods one or more notes are appended. These notes are not to be regarded as part of the methods. They are used merely to draw attention to certain points which might otherwise be overlooked, or to give information to assist in applying the methods.

The following clauses of BS 3144 have been superseded as follows:

General Instructions and Clause 2: BS EN ISO 2419:2002, *Leather — Physical and mechanical tests — Sample preparation and conditioning*;

Clause 1: BS EN ISO 2418:2002, *Leather — Chemical, physical and mechanical and fastness tests — Sampling location*;

Clause 3: BS EN ISO 2589:2002, *Leather — Physical and mechanical tests — Determination of thickness*;

Clause 4: BS EN ISO 2420:2002, *Leather — Physical and mechanical tests — Determination of apparent density*;

Clause 5: BS EN ISO 3376:2002, *Leather — Physical and mechanical tests — Determination of tensile strength and percentage extension*;

Clause 6: BS EN ISO 3377-2:2002, *Leather — Physical and mechanical tests — Determination of tear load — Double edge tear*;

Clause 7: BS EN ISO 3378:2002, *Leather — Physical and mechanical tests — Determination of resistance to grain cracking and grain crack index*;

Clause 13: BS EN ISO 5402:2002, *Leather — Physical and mechanical tests — Determination of flex resistance by flexometer method*;

Clause 17: BS EN ISO 3380:2002, *Leather — Physical and mechanical tests — Determination of shrinkage temperature up to 100 degrees C*;

Clause 18: BS EN ISO 2417:2002, *Leather — Physical and mechanical tests — Determination of the static absorption of water*;

Clause 21: BS EN ISO 5403:2002, *Leather — Physical and mechanical tests — Determination of water resistance of flexible leather*;

Clause 24: BS EN ISO 14268:2002, *Leather — Physical and mechanical tests — Determination of water vapour permeability*.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 33 and a back cover.

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8 Measurement of distension and strength of grain by the ball burst test

8.1 Introduction

This method is based on method SLP 9 of the Society of Leather Trades' Chemists and on method IUP/9 of the International Union of Leather Chemists' Societies. It may be used with any light leather, but it is intended more particularly for use with boot and shoe upper leathers.

For other than full grain leather, the grain shall be deemed to be that surface which has been dressed or otherwise finished in such a way as to simulate a grain, or is intended to be used in place of the grain of an ordinary leather.

8.2 Instrument to be used in the tests

Use an instrument provided with the following parts:

8.2.1 A clamp for holding securely the rim of a circular flat disk of leather, while leaving the central portion of the disk free to move.

The clamp shall hold the clamped area of the disk stationary when any load up to 80 kgf is applied to its centre. The boundary between the free and the clamped areas shall be sharply defined. The diameter of the free area shall be 25.0 mm.

8.2.2 A mechanism for thrusting a steel ball, without rotation, against the centre of the flesh side of the leather disk, and a means for measuring the load applied. The ball shall be of 6.25 mm diameter, and the accuracy of the load measuring mechanism shall be such that the load at grain crack and at burst of the specimen is measured with an error not exceeding 3 %.

8.2.3 Means for measuring the distension of the leather disk.

The device used shall be calibrated directly in tenths of a millimetre, and the errors of the scale shall at no part of it exceed 0.05 mm. The distension shall be taken as the distance through which the clamp moves relative to the ball in a direction normal to the plane occupied by the leather when the disk is clamped and is under zero load: no account shall be taken of the compression of the leather and of its decrease in thickness resulting from the application of load by the ball.

8.3 Preparation of specimens

Cut the specimens to the dimensions required for clamping them in the apparatus, and condition them in accordance with the method given in BS EN ISO 2419.

8.4 Procedure

8.4.1 Clamp the conditioned specimen in the instrument with its “flesh” surface adjacent to the ball, and its “grain” surface flat.

8.4.2 Increase the distension at a rate of approximately one-fifth of a millimetre per second, and watch the “grain” surface for the occurrence of a crack in the “grain”. When grain crack occurs note the load and distension and continue the loading with as little delay as possible. If the disk bursts before the maximum load of the instrument is reached, note the load and distension at burst.

8.4.3 The report of any test should state the load and distension at grain crack, and the corresponding values at burst if the leather disk bursts before the maximum load is reached. If a number of tests are made, report the results of each and not merely their arithmetic mean. If the sample is known to be other than full grain leather, state this.

NOTE 1 Calibrate periodically the mechanism used for the measurement of the load. Also determine the zero reading of the distension scale and if it is in error apply the appropriate correction to each reading of distension.

NOTE 2 Figure 13 and Figure 14 show details of the clamping head and other parts of an instrument which is suitable for use with this method¹⁾. Figure 15 shows the specimen used with this instrument.

NOTE 3 If there is a pause during the distension of a specimen, relaxation of stresses in it occurs, and the load reading tends to fall. It is for this reason that the load and distension at grain crack and burst should be measured with the minimum of delay. The instrument should have a maximum-reading pointer to minimize errors of this kind, and this should be used for the readings of load. Even so, the pause for reading should be as brief as possible.

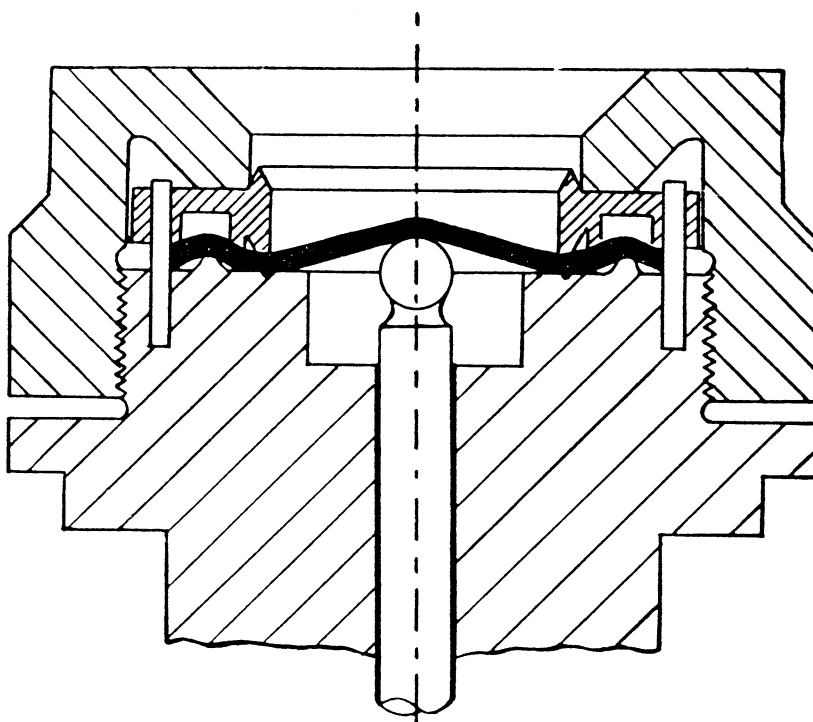


Figure 13 — Cross section of clamping head with specimen in position

¹⁾ This instrument can be obtained from The British Boot, Shoe and Allied Trades' Research Association, Rockingham Road, Kettering, Northants, England.

Dimensions in millimetres

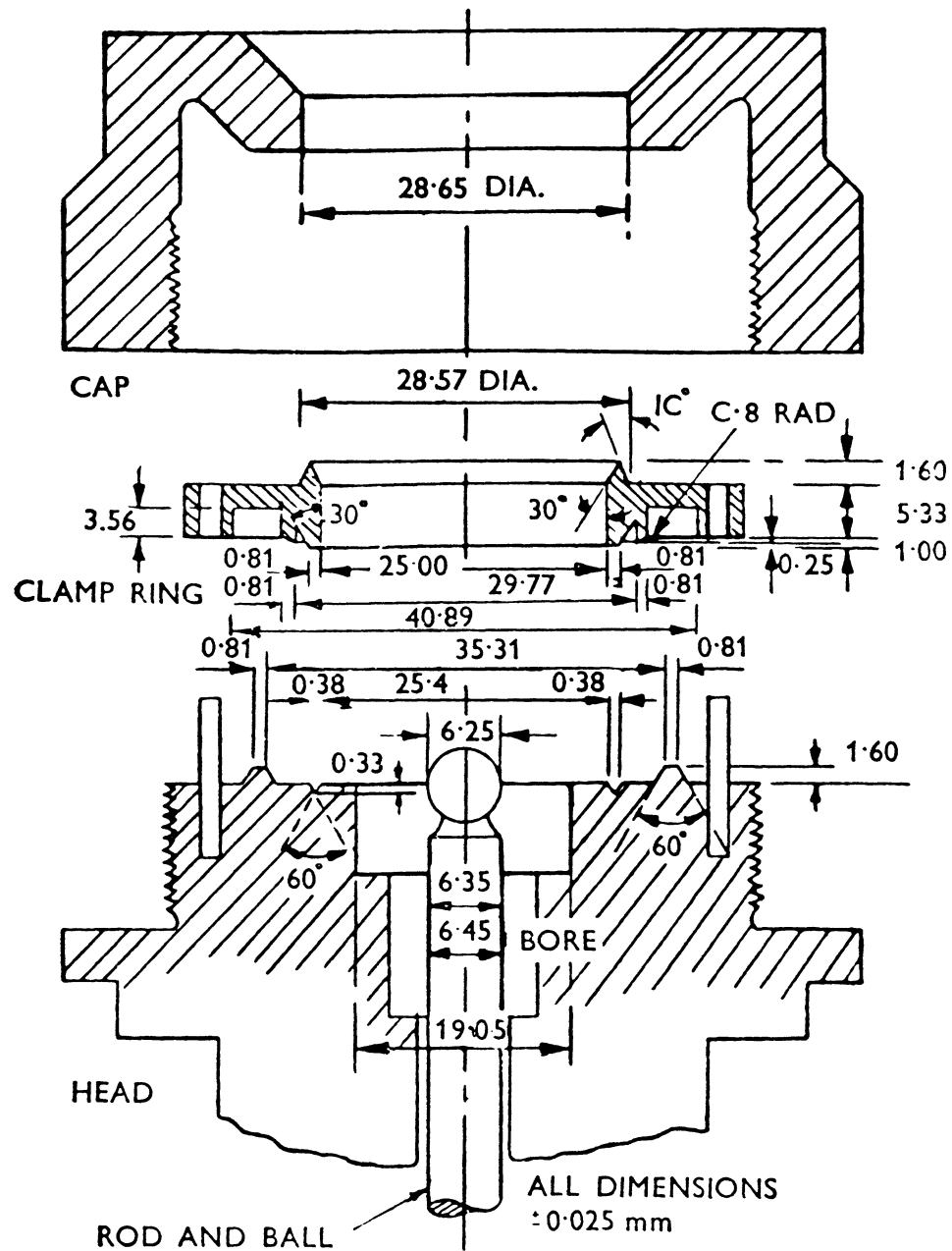
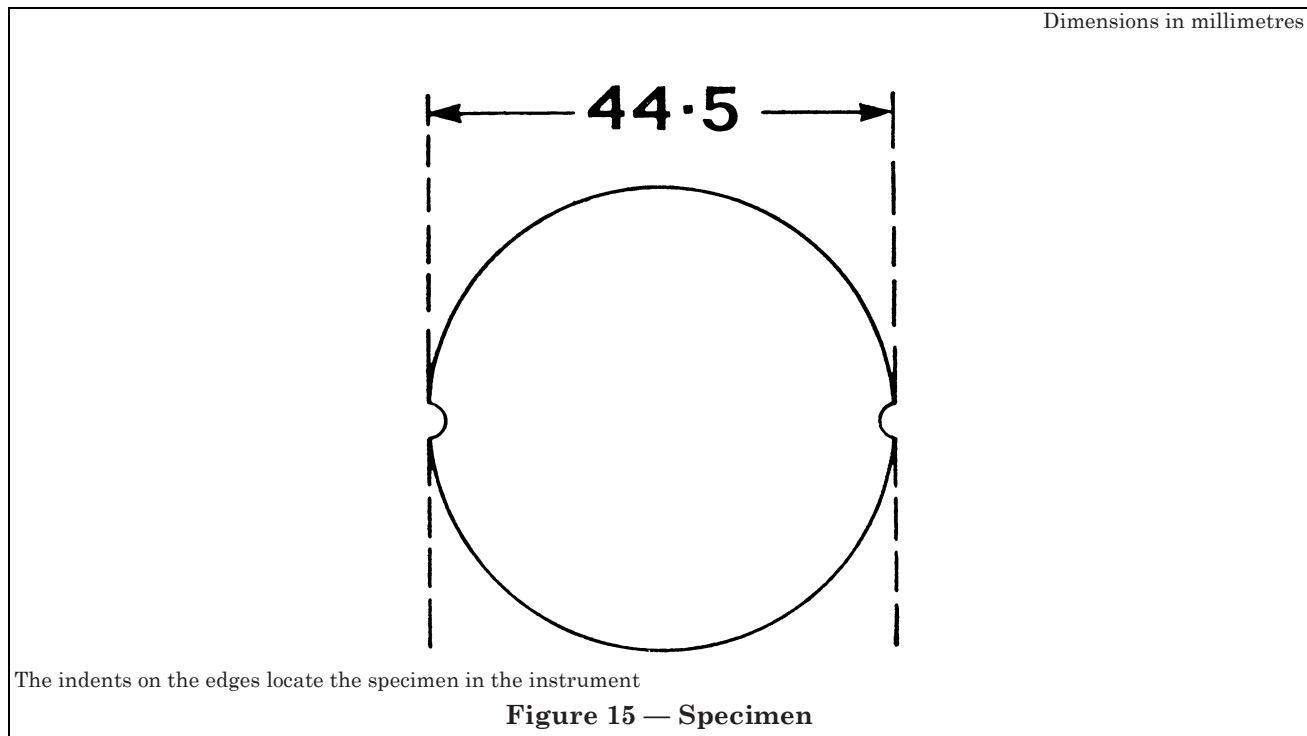


Figure 14 — Details of clamp and head



9 Measurement of two-dimensional extension

9.1 Introduction

This method is based on method SLP 10 of the Society of Leather Trades' Chemists and on method IUP/13 of the International Union of Leather Chemists' Societies. It can be used with any type of light leather.

9.2 Principle of the method

The specimen, which consists of a circular disk, is clamped at its edges and pressure is applied hydrostatically to its flesh surface. This causes the disk to distend and assume a form which is approximately that of a spherical cap. The changes which occur in the grain surface and finish are observed, and the heights of the cap are noted at various pressures; from these heights the area extension of the specimen is calculated.

9.3 Preparation of the specimens

It is informative to make tests on specimens conditioned at a low and a high relative humidity as well as at the standard relative humidity of 65 %. Cut as circular disks of 68 mm diameter, two specimens for use at 65 % relative humidity, and one specimen for conditioning at each of the other humidities which are specified (see Note 2). One of the two specimens for the standard humidity is used merely for adjustment of the apparatus (see 9.5.1) and not for measurement. Condition both these specimens in accordance with the method given in BS EN ISO 2419, and measure the thickness of that which is to be used for measurement in accordance with the method given in BS EN ISO 2589. If tests at other humidities are specified, condition one specimen at each humidity (see Note 2) and measure its thickness in the same way.

9.4 Description of apparatus²⁾

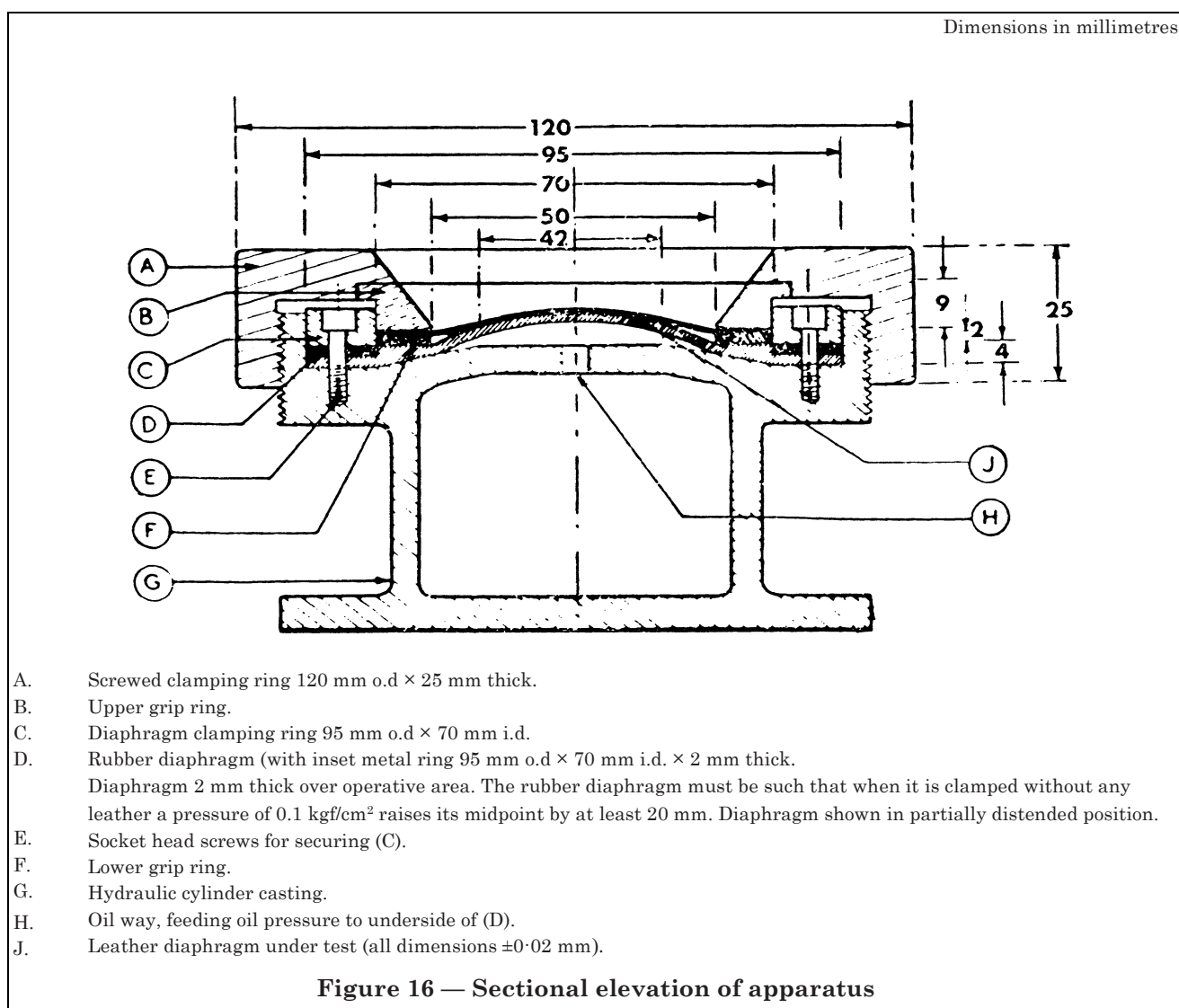
The apparatus consists of the following parts:

9.4.1 A metal head in which the specimen is clamped for testing with an oil resistant rubber diaphragm beneath it. The dimensions and functions of the various parts of the head are indicated in the sectional elevation shown in Figure 16.

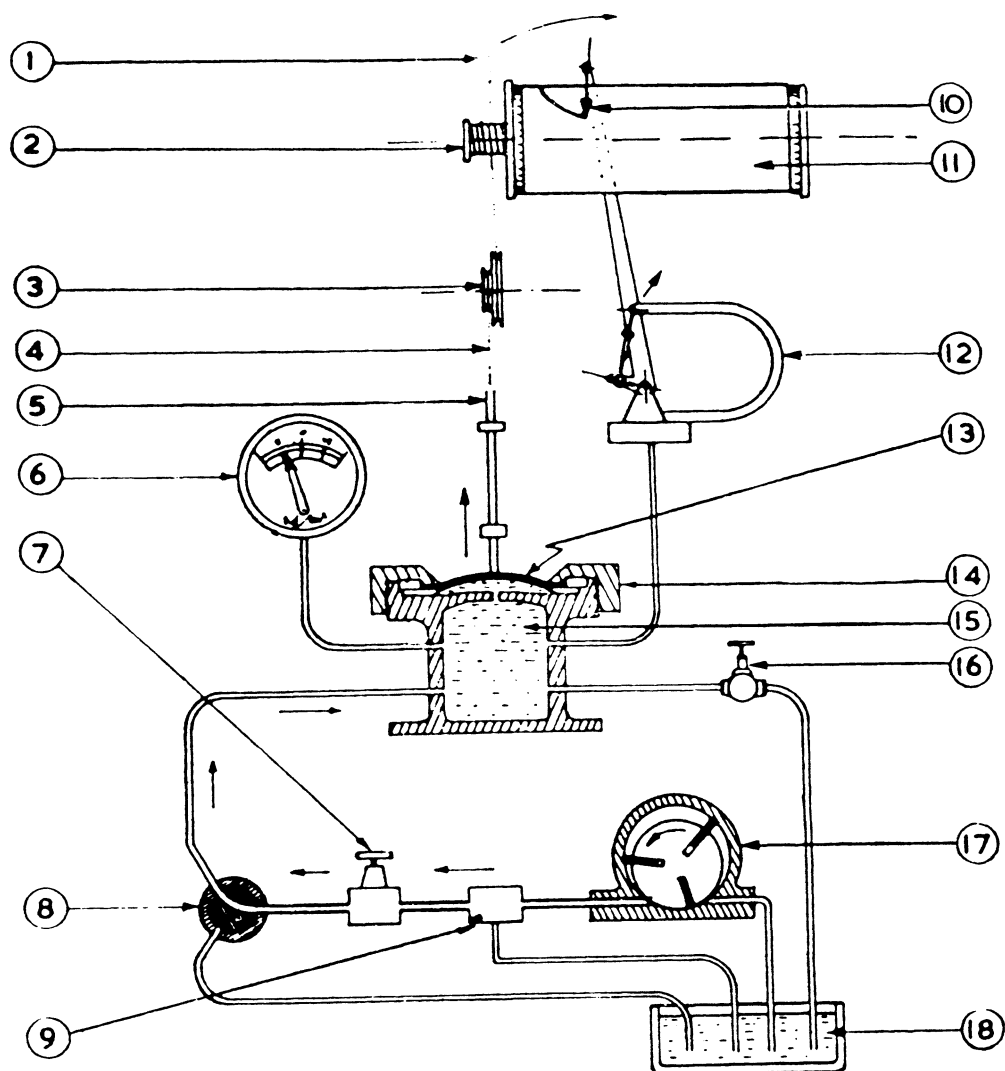
9.4.2 A constant output rotary oil pump and valves which can be set to raise the pressure applied to the leather to 10 kgf/cm^2 in 30 seconds (see the schematic diagram in Figure 17).

9.4.3 To indicate the pressure, a manometer reading from 0 to 25 kgf/cm^2 and having errors not greater than 0.1 kgf/cm^2 at any part of its range.

9.4.4 Means for recording automatically in graphical form the pressure applied to the leather and the corresponding height of the spherical cap, the pressures being plotted as ordinates and the heights as abscissae (a suitable arrangement is indicated in Figure 17). The pressures recorded automatically must have errors not greater than 0.1 kgf/cm^2 and the heights of the cap must not have errors greater than 0.5 mm.



²⁾ A suitable apparatus can be obtained from Bally Shoe Factories Ltd., Schoenenwerd, Switzerland.



1. Cord to jockey pulley and counterpoise (not shown).
2. Helical vee grooved pulley, integral with 11.
3. Compound jockey vee pulley on miniature ball bearings.
4. Cord attached to 5.
5. Vertical rod, counterpoised by 1, sliding in antifriction bearings. The diameter of the rod is 6.25 mm, and it applies to the leather a load not greater than 25 g.
6. Pressure gauge, 0.25 kgf/cm².
7. Adjustable rate of flow valve.
8. Three-way valve.
9. Relief valve.
10. Pen.
11. Recording drum on miniature ball bearings.
12. Bourdon tube operating recording pen.
13. Leather test sample.
14. Clamp ring.
15. Test vessel.
16. Outlet valve.
17. Constant output rotary oil pump.
18. Oil sump.

Figure 17 — Schematic diagram of apparatus and key