A test container **26** according to the present invention is mounted in the right-most mounting position of flange **18**, as shown in FIG. **1**.

Referring now to FIGS. **2** and **3**, the details of a test container embodying the present invention may be seen. Test container **26** comprises a radiation permeable member **28**, such as a quartz glass cylinder, which is sealed by means of gaskets **30** to upper and lower flanges **32** and **34**, respectively. The upper flange **32** is affixed to test mount **16** and has a hook or hanger **36** attached to its upper face whereby test container **26** may be mounted on flange **18** in the apparatus of FIG. **1**. When test container **26** is assembled for testing, as shown in FIG. **2**, an O-ring **38**, adjacent hole **40** in lower flange **34**, provides a gas-tight seal between lower flange **34** and a nut **44** which is threaded on a stud **42**, stud **42** being fixed to the lower end of test mount **16**. Test container **26** may be disassembled for reloading by removing nut **44** from stud **42**, thus permitting lower flange **34** and radiation permeable member **28** to be removed, and further permitting test mount **16** to be reloaded in the usual way.

Two valves **46** are located in lower flange **34** and may be used for filling test container **26** with a suitable atmosphere at a selected pressure.

A modified form of test container **26** is shown schematically in FIG. **4**. The difference between this form of test container and that of FIGS. **2** and **3** consists in the provision of means for cooling the specimens **22**. This cooling means consists of a wall **48**, mounted horizontally inside container **26**. The wall **48** is sealed to the inside of container **26** and consists mainly of the rear walls of test mount **16**. After connecting wall **48** to a coolant supply, cooling of the specimens may be brought about by circulating coolant between the specimens. Thus, the disadvantages which result from heating of the specimens due to intensive irradiation may be effectively reduced.

Yet another embodiment of the invention is shown schematically in FIG. **5**, wherein a generally cylindrical container for specimens **22** is designated by the reference numeral **50**. Container **50** surrounds radiation source **14**, and defines a generally toroidal chamber. This generally toroidal chamber may be subdivided by partitions **52** into a plurality of single sections **54**. Container **50**, or its individual sections, may be filled with a suitable atmosphere, or with suitable liquids, by means analogous to the filling means used in the embodiment of FIGS. **2** and **3**, or by other means which will occur to those having ordinary skill in the art. Means may be provided to rotate container **50** about radiation source **14**, or, alternatively, container **50** may be maintained fixed and unrotated and the specimens within container **50** may be caused to execute cyclic movements.

The basic method of accelerated testing of the light and weather fastness of materials according to the present invention will now be described.

In testing with the open test mounts of the prior art the specimens cannot be irradiated at intensities greater than a certain limit because higher irradiation intensities produce results in many materials which deviate from the effects produced in those same materials by exposure to normal atmospheric conditions.

This deviation may be explained as follows. As a result of the absorption of photons during irradiation, organic molecules are broken down and radicals developed. These radicals are chemically very active and react readily with the available reactants in their surroundings. The main available reactant is oxygen from the air, which is not only available at the surface of the material under test, but also diffuses into the material under test. The rate at which these radicals react with available oxygen is determined by the quota or available volume of oxygen within the material under test, which is in turn limited by the diffusion of oxygen into the material under test. If in testing with the apparatus of the prior art having open test mounts the intensity of irradiation is raised above normal ambient levels, more radicals will develop per unit volume of material under test than will develop under natural ambient conditions. However, the rate at which these radicals react with available oxygen will necessarily remain the same, since the quota of available oxygen is fixed by diffusion, as pointed out above. Thus, when super ambient irradiation is undertaken in the accelerated testing devices of the prior art spurious reaction products will result which, under natural atmospheric influence, either would not be evolved at all or would be evolved only in small amounts, such as molecules of cancellated structure and molecular recombinations.

According to the present invention the quota of available oxygen may be increased in accordance with the number of molecules broken down as a result of irradiation. To bring about this increase in available oxygen the specimens **22** are mounted on a test mount **16** which then, in accordance with the principles of my invention, is sealed in a gas-tight container **26** which can be filled with oxygen at super ambient pressures. By raising the pressure of the oxygen within container **26** the rate of diffusion of the oxygen into the body of the test specimens may be increased, thus increasing the quota of available oxygen at the sites at which the radicals are evolved. By this application of the teachings of my invention, the ratio of available oxygen concentration to radical concentration may be maintained equal to that found in normal ambient conditions, even though the intensity of irradiation is greatly increased and the speed of testing therefore greatly accelerated. The test results obtained in accordance with my invention are not only obtained much more rapidly, but are also reliable and comparable with the results of much slower testing carried out in normal ambient conditions.

In addition to the advantages set out hereinabove, the apparatus according to my invention makes it possible to collect information which was not hitherto available regarding the changes which take place in the specimen during testing. That is to say, the test container **26** of my invention makes it possible to collect the accumulated gas reaction products evolved during testing for subsequent quantitative and qualitative analysis.

It will thus be seen that the object set forth above, among those made apparent from the preceding description, sufficiently attained, and, since certain changes may be made in the constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative, and not in a limiting sense.

It is particularly noted that although the above example of the application of my invention had reference to oxygen only, the test container of my invention can be filled with any combination of gases, vapors, or mixtures thereof, depending upon the constituents found to be present in actual ambient atmospheres. For instance, it may be desired to test the behavior of a material under exposure to so-called "industrial atmospheres" which include simulated constituents than pure air. Furthermore, it is possible, using the apparatus according to the invention, to test a specimen which is partially dipped in a liquid, the protruding portion of the specimen being exposed to an atmosphere which includes vapors of the liquid. In this way otherwise difficult to obtain conditions can be simulated, such as those encountered in ship painting, especially conditions occurring at the water line where materials are subject to steady alternation of salt water attack and atmospheric exposure. These alternating conditions cause rapid fatigue and require especially careful inspection. Such alternating conditions can be accurately simulate only with a container according to the invention. Finally, the device of the invention can also be used, in accordance with another aspect of the invention, to subject a specimen to a constant flow of any gas in order to test the characteristics of materials under such conditions. Additionally, the apparatus and methods of this invention may be combined with known apparatus and techniques such as the determination and control of the temperature and humidity of the specimen.

It is also to be understood that the following claims are intended to cover all of the generic and specific features of the