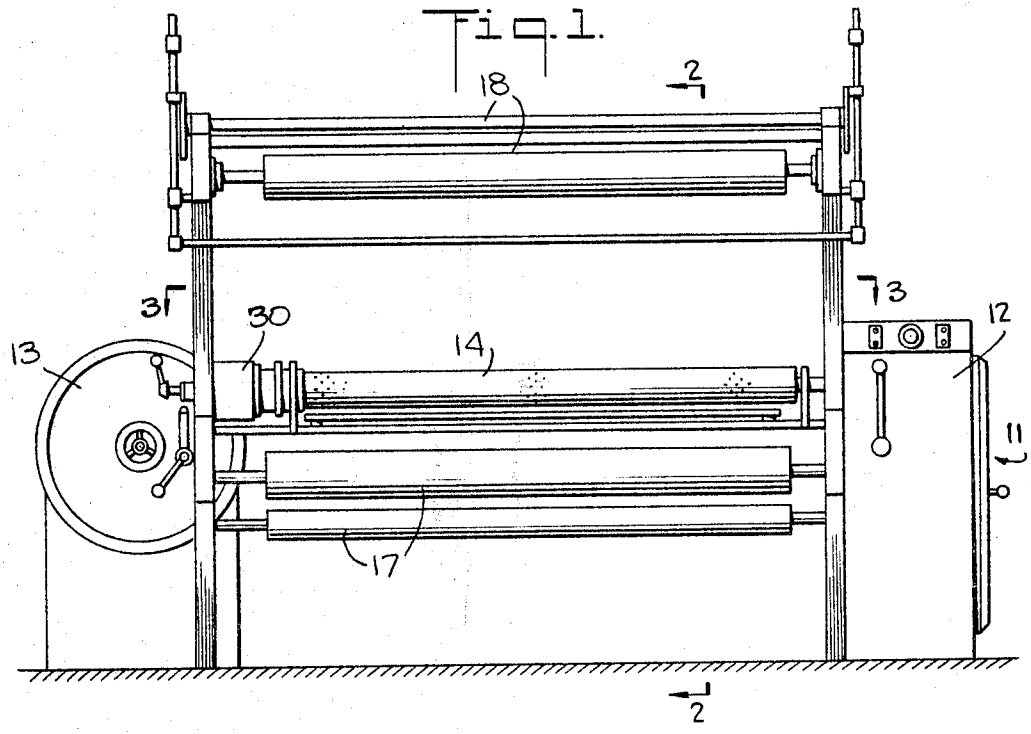
Sept. 6, 1966 P. ALBERTO ETAL 3,270,429

APPARATUS AND METHOD FOR FINISHING FABRICS

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Fig. 1.



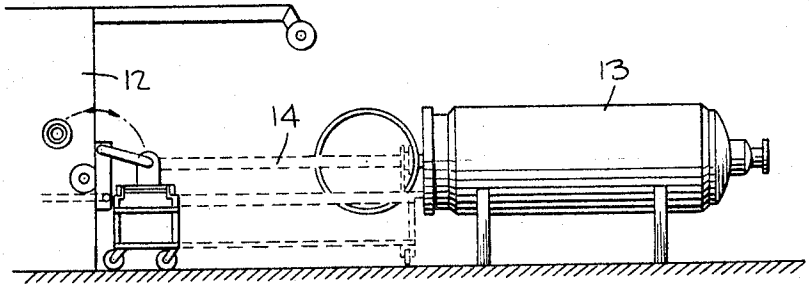
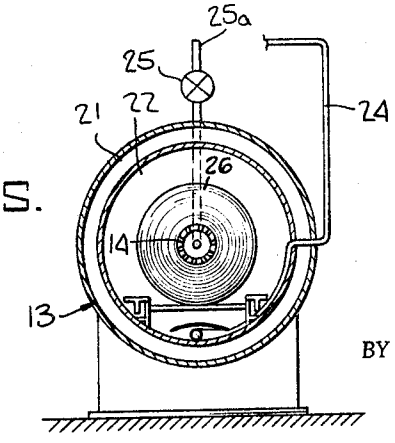


Fig. 2.

Fig. 3.



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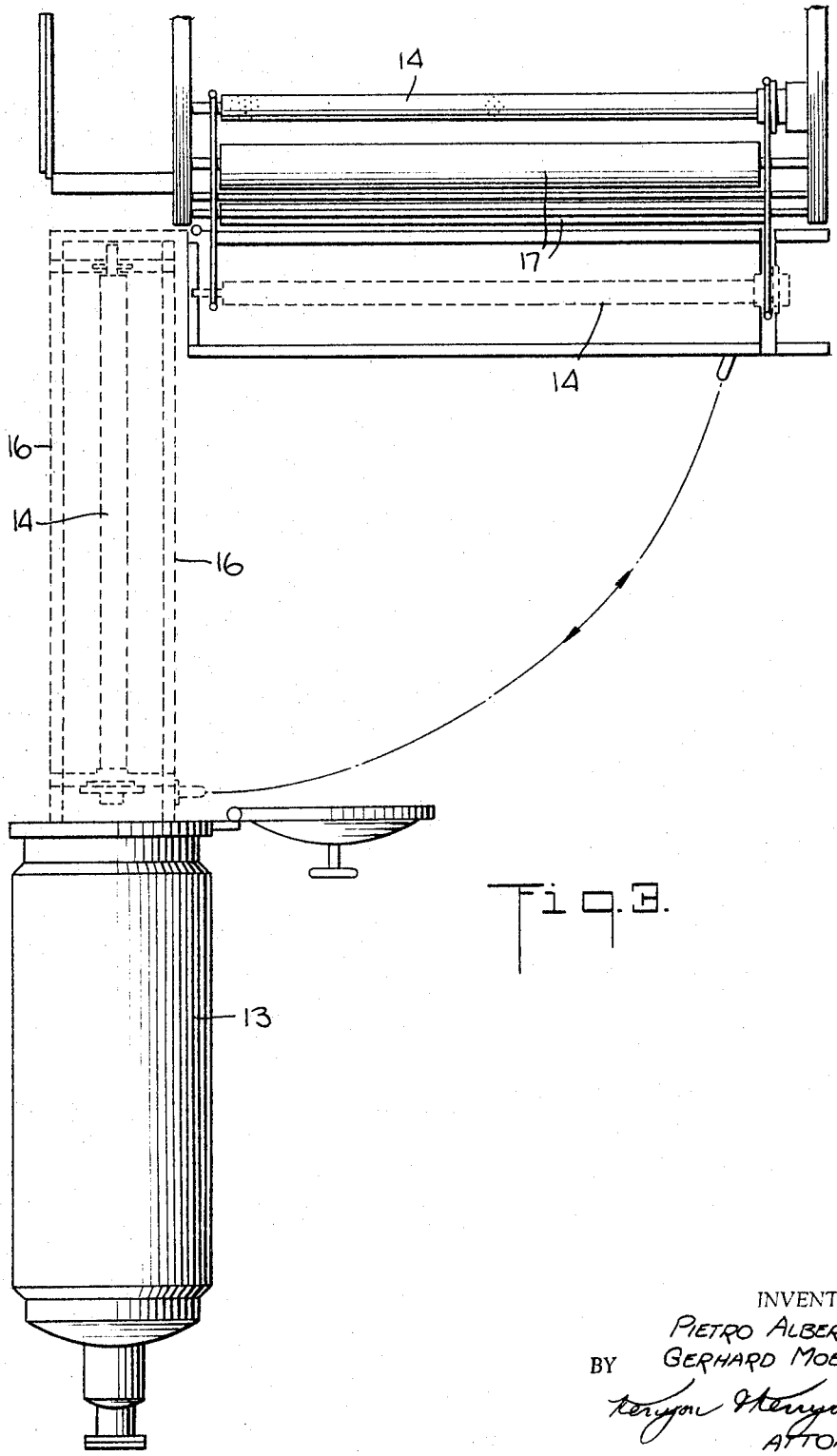


Fig. 3.

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APPARATUS AND METHOD FOR FINISHING FABRICS

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Fig. 4.

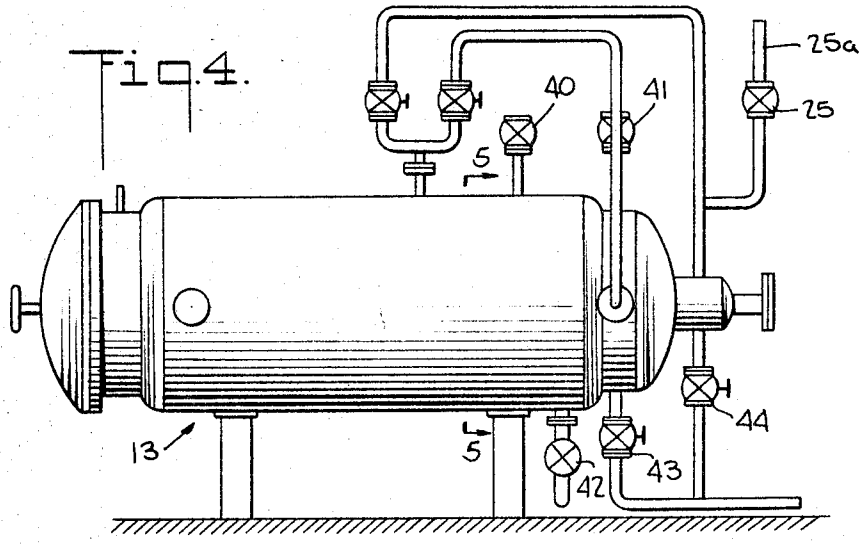
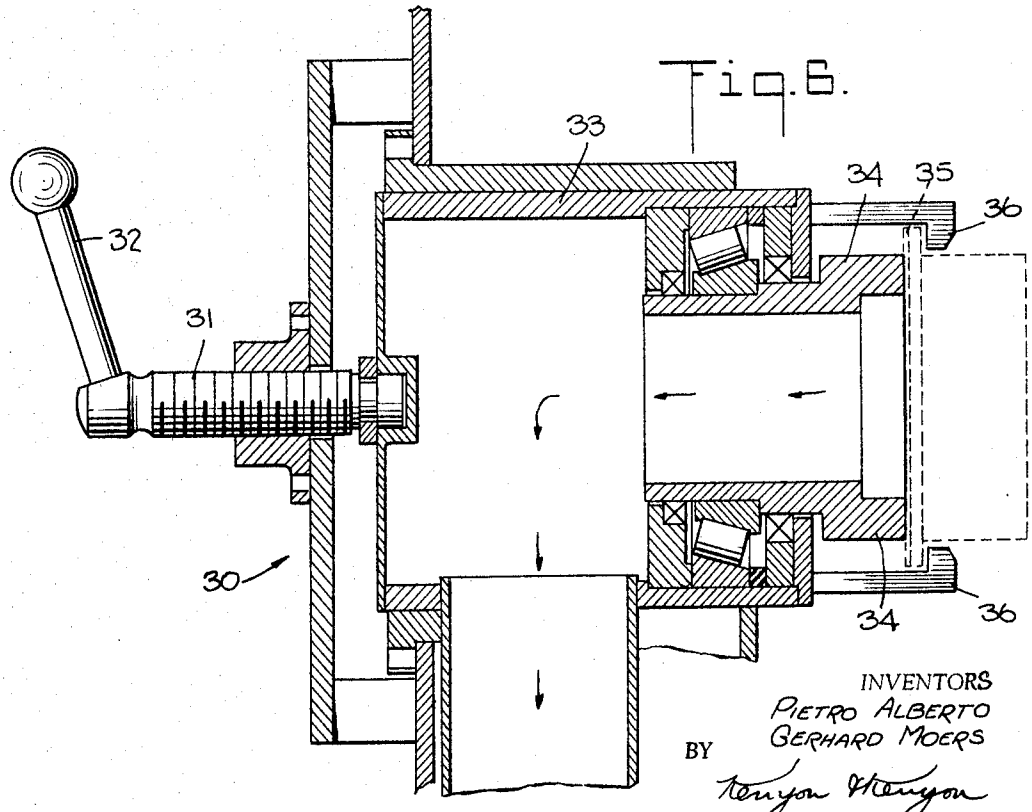


Fig. 6.



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APPARATUS AND METHOD FOR FINISHING FABRICS

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2 Claims. (Cl. 34—6)

This invention relates in general to an apparatus and method for finishing fabrics and more particularly to such an apparatus and method for finishing woolen and mixed wool fabrics to provide an improved texture.

Unless specifically indicated otherwise, the phrase "wool fabric" will refer, in this application, to fabrics which are wholly wool or mixed wool fabrics. We are concerned herein with the treatment of wool fibers whether or not those wool fibers constitute the entire fabric being subject to treatment. This application is concerned with an improved finishing process for wool fabrics which by analogy to the prior art finishing processes may be termed decatizing or decating. It should also be understood that wool herein refers to most if not all animal fibers.

This invention is concerned with a finishing process which will impart to wool fabrics certain permanent characteristics such as gloss, brilliancy, plasticity, smoothness, softness and dimensional stability. Prior art wool fabric treatment techniques were capable of imparting one or more of these characteristics to a wool fabric but always resulted in sacrificing certain of these characteristics. Thus there are steam treatment techniques which are capable of imparting a good shrink resistant characteristic and even a certain gloss to the wool fabric so treated. However, fabrics so treated turned out to be hardened and flattened so that they lose much of their softness of touch and fluffy aspect. Even where a more or less satisfactory compromise is made between the various characteristics, subsequent washing, ironing and steaming, as carried out by tailors and dressmakers, result in a loss of many of these characteristics.

Accordingly, it is a major purpose of this invention to provide an improved finishing technique for wool fabrics which will attain the hitherto conflicting desirable characteristics of soft touch, glossy look and dimensional stability.

It is a further major purpose of this invention to attain these characteristics in a permanent form so that subsequent use and cleaning of the fabric will not significantly diminish the favorable characteristics.

It is a related purpose of this invention to provide an improved decatizing process which greatly reduces residual shrinkage.

Other objects and purposes of this invention will appear from a consideration of the detailed description and drawings, in which:

FIG. 1 is a front elevation view of the apparatus used in the practice of this invention;

FIG. 2 is a side view in partial section and partial elevation taken along the plane 2—2 of FIG. 1;

FIG. 3 is a top view in elevation of a portion of the apparatus of this invention, this figure being taken along the plane 3—3 of FIG. 1;

FIG. 4 is a side elevation of the autoclave used in this invention, shown in sufficient detail to illustrate the relief and other valves employed in the practice of this invention;

FIG. 5 is a cross-section of the autoclave shown in FIG. 4 taken along the plane 5—5 of FIG. 4; and

FIG. 6 is a longitudinal cross-section of the extraction mechanism used in cooling the fabric after treatment by the process of this invention.

FIGS. 1, 2 and 3 illustrate the plant 11 arrangement as taught by this invention. The two main units of this plant are the preparation unit 12 and the autoclave 13.

The preparation unit 12 includes a perforated cylinder 14 on which the fabric to be finished is rolled. As is done in the prior art, the fabric to be finished is rolled onto the perforated cylinder 14 together with a smooth cotton material to form a fabric roll 26, shown in cross-section in FIG. 5, such that the fabric to be treated alternates with the porous cotton material.

The perforated cylinder 14 is held on a carriage 16, which carriage 16 may be rotated into the position shown in dotted lines in FIG. 3 so that the carriage and perforated cylinder 14 may be introduced and removed from the autoclave 13. However, prior to being introduced into the autoclave, as well as after being removed from the autoclave 13, the perforated cylinder 14 is in the position shown in solid lines in FIGS. 1, 2 and 3, so that the fabric to be treated may be rolled onto or removed from the cylinder 14. For such purpose, the preparation unit 12 is fitted with stretchers 17 for the fabric. The stretchers 17 serve to assure that the fabric is tightly wound on the cylinder 14. After the fabric has been treated, a standard mechanism 18 is employed to remove and fold the fabric.

FIGS. 4 and 5 illustrate details of the autoclave unit 13. The important factors concerning this autoclave 13 and its relationship to the invention are the manner in which it is operated and the fact that it is adapted to such operation.

Steam under pressure is maintained in the outer chamber 21 of the autoclave 13 and thereby keeps the inner chamber 22 warm. This steam is introduced into the inner chamber 22 of the autoclave 13, at the appropriate time, by means of the steam line 24. The interior of the perforated cylinder 14 is connected to the outside atmosphere through a valve 25 and vent 25a.

When the valve in the steam line 24 is opened, the incoming steam from the line 24 causes the air that is within the inner chamber 22 to become heated. This hot dry air is then used to dehydrate the fabric on the fabric roll 26.

In order to make sure that the hot dry air does not pass through the fabric so quickly as to inadequately dehydrate the fabric, it is preferable to initially prevent the air within the inner chamber 22 from being exhausted through the vent 25a. The valve 25 may therefore be closed, or partially closed, during the initial portion of this cycle. The fabric roll 26, itself, acts as a filter and develops considerable back pressure so that in many instances it may not be necessary to close the valve 25 in order to develop the desired initial pressure within the inner chamber 22. What is important is that either by means of the back pressure of the fabric roll 26 or by means of an adjustment of the valve 25 or a combination of both, the exit of air from the inner chamber 22 is slowed down to a point where there is some pressure build up.

There are two separate but related reasons for slowing down the rate at which the dry air is forced out of the inner chamber 22 by the steam. The first reason is to assure that the fabric is subjected to a hot dry air environment for a sufficient period of time to adequately dehydrate the fabric. The second reason is to avoid too much of a mixture of the incoming steam with the air that is in the inner chamber 22. If the incoming steam and the air in the inner chamber were mixed prior to the air being removed from the inner chamber 22, then the fabric would not be subjected to the dehydrating hot dry air environment which is important for

the proper processing of the fabric according to this invention.

When all the air has been discharged and steam begins to issue from the vent 25*a* controlled by the valve 25, the valve is again closed and pressure is allowed to build up to whatever pressure is desired and required for the particular fixing of the particular fabric.

In one embodiment the valve 25 was maintained closed while the steam was admitted into the inner chamber to build up pressure. The valve 25 was opened when the pressure in the inner chamber reached approximately 1½ atmospheres. On the opening of the valve 25 hot dry air came out of the vent 25*a* and was followed for a short duration by a mixture of steam and air which was immediately followed by pure steam being emitted from the vent 25*a*. At the point where all the air has been discharged from the inner chamber 22, as evidenced by pure steam being emitted from the vent 25*a*, the valve 25 is closed and compression is started. The pressure is then permitted to build up to some value generally between 13 p.s.i. and 30 p.s.i. above atmospheric. When this predetermined pressure is achieved, the valve on the line 24 is closed so that no more steam is admitted to the inner chamber 22. The steam under pressure environment is maintained for a period of time that usually does not exceed 3 minutes and after that predetermined time period the steam is released by opening an exhaust valve. The purpose of this 3 minute compression portion of the treatment cycle is to fix dimensional stability in a permanent manner.

One of the apparent advantages of fixing the fabric in the fashion described in this invention relates to the strength of the finished fabric. Maintaining the valve 25 closed at the start of the cycle so that the pressure in the autoclave 13 is built up to a point where it serves to cushion the impact of the steam on the fabric itself results in lessening the mechanical shock to the fabric. The lessened mechanical shock results in a fabric that has greater strength than would otherwise be obtained.

Thus it can be seen that once the autoclave 13 is closed, air is not immediately removed. By contrast with the older methods, advantage is taken of the temperature and pressure of the steam to create a dehydrating heated air cushion which greatly effects the dynamics of the steam treatment.

As may be seen in FIG. 4, the autoclave 13 includes the usual devices such as an outer chamber safety valve 40, an inner chamber safety valve 41 and condensate discharge valves 42, 43 and 44.

FIG. 1 shows the perforated cylinder 14 mounted on a rack mechanism which permits rolling the fabric onto the perforated cylinder 14 prior to treatment in the autoclave 13 and also permits unwinding the treated fabric off the perforated cylinder 14. As the fabric is unwound from the perforated cylinder 14, after treatment, air is sucked out of the center of the perforated cylinder 14 so that the outside air is forced through the fabric roll 26 and thus serves to cool the fabric after treatment. An extraction mechanism 30 is illustrated coaxial with the cylinder 14 and is the means by which a suction pump may be connected to communicate with the interior of the cylinder 14.

FIG. 6 illustrates, in longitudinal cross-section, the details of this extraction mechanism 30. A portion of a perforated cylinder 14 is shown in dotted lines held by this extraction mechanism 30. The path of air from the center of the perforated cylinder 14 is shown by arrows. A shank 31 is manually rotated clockwise or counter-clockwise by means of a handle 32. When rotated clockwise, the shank 31 causes the supporting frame 33 to move forward (to the right in FIG. 6) and thereby force the inner frame piece 34 forward against the perforated cylinder 14. This, in turn, forces the flange 35 on the perforated cylinder 14 back against the stops 36 so that the perforated cylinder 14 is tightly held between the stops 36 and the inner frame 34. A washer may be located along the forward edge of the inner frame 34 so as to assure communication between the interior of the inner frame 34 and the interior of the perforated cylinder 14 without leakage between the juncture. The use of an extraction mechanism, such as the extraction mechanism 30 illustrated in FIG. 6, enhances the usefulness of this invention in that it permits a considerable saving in time after autoclave treatment. This extraction mechanism 30 causes rapid cooling of the fabric at the same time that the fabric is being unwound from the perforated cylinder 14 and in this fashion introduces a time saving factor into the entire treatment process.

A practical embodiment of the invention has been described and illustrated. However, it must be remembered that the heart of this invention is in the two step process of treating part wool fabrics which involves: first, passing hot dry air through the fabric so as to dehydrate the fabric to a point where preferably there is less than 7% of the moisture left in the fabric, and secondly, subjecting the dehydrated fabric to an environment of relatively dry steam which is at a pressure preferably 30 lbs. above atmospheric and necessarily more than 13 lbs. above atmospheric for a period of time sufficiently long to adequately dimensionally stabilize the fabric. This time period is preferably between 2 and 3 minutes for most fabrics.

It has been noted that wet steam does not produce as good results as does dry steam. It is presumed that the reason for this is that the moisture carried by the wet steam simply rehydrates the fabric to a point which obviates the first step, namely the dehydrating step, in this invention. It is presumed that when the fabric is rehydrated by the steam itself, there occurs a fixing of the fibers such as to provide the improved finish afforded by this invention.

Certain variations in the above method and mechanism would be obvious to those skilled in this field and it is intended in the claims to include all such variations.

For example, it would be possible to dehydrate the fabric by some other means as long as the fabric remained dehydrated, to a point where preferably less than 7% of the moisture is retained in the fabric, when the steam impinged on the fabric. It is a fundamental principle of this invention to dehydrate the fabric before it is subjected to treatment involving steam under pressure.

What is claimed is:

1. The method of treating wool fabric to obtain dimensional stability and permanent set comprising the steps of:

dehydrating the fabric to a point where less than 7% of the original moisture in the fabric remains,

immediately thereafter, passing dry steam under pressure at a controlled rate through said fabric to displace substantially all of the air held within said fabric,

subjecting said fabric to a dry steam environment having a pressure between approximately 13 and 30 pounds per square inch above atmospheric, and

maintaining said dry steam environment for a period of no more than substantially three minutes.

2. The method of treating wool fabric to obtain dimensional stability and permanent set comprising the steps of:

forming a fabric roll,

passing warm, dry air at above atmospheric pressure through said fabric roll until less than 7% of the original moisture in the fabric remains to provide a roll of dehydrated fabric,

passing dry steam under pressure at a controlled rate through said roll of dehydrated fabric until substantially all of the air held by said fabric roll is

displaced with dry steam to provide an airless roll of fabric having a dry steam environment,

building the pressure of said dry steam environment to a predetermined value of between 13 and 30 pounds per square inch above atmospheric, and

maintaining said pressure for a predetermined time period of no more than three minutes.

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