Oct. 24, 1961 B. STEVENS, JR 3,005,327

APPARATUS FOR TREATMENT OF LONG WEBS UNDER PRESSURE

Filed Nov. 21, 1958 3 Sheets-Sheet 1

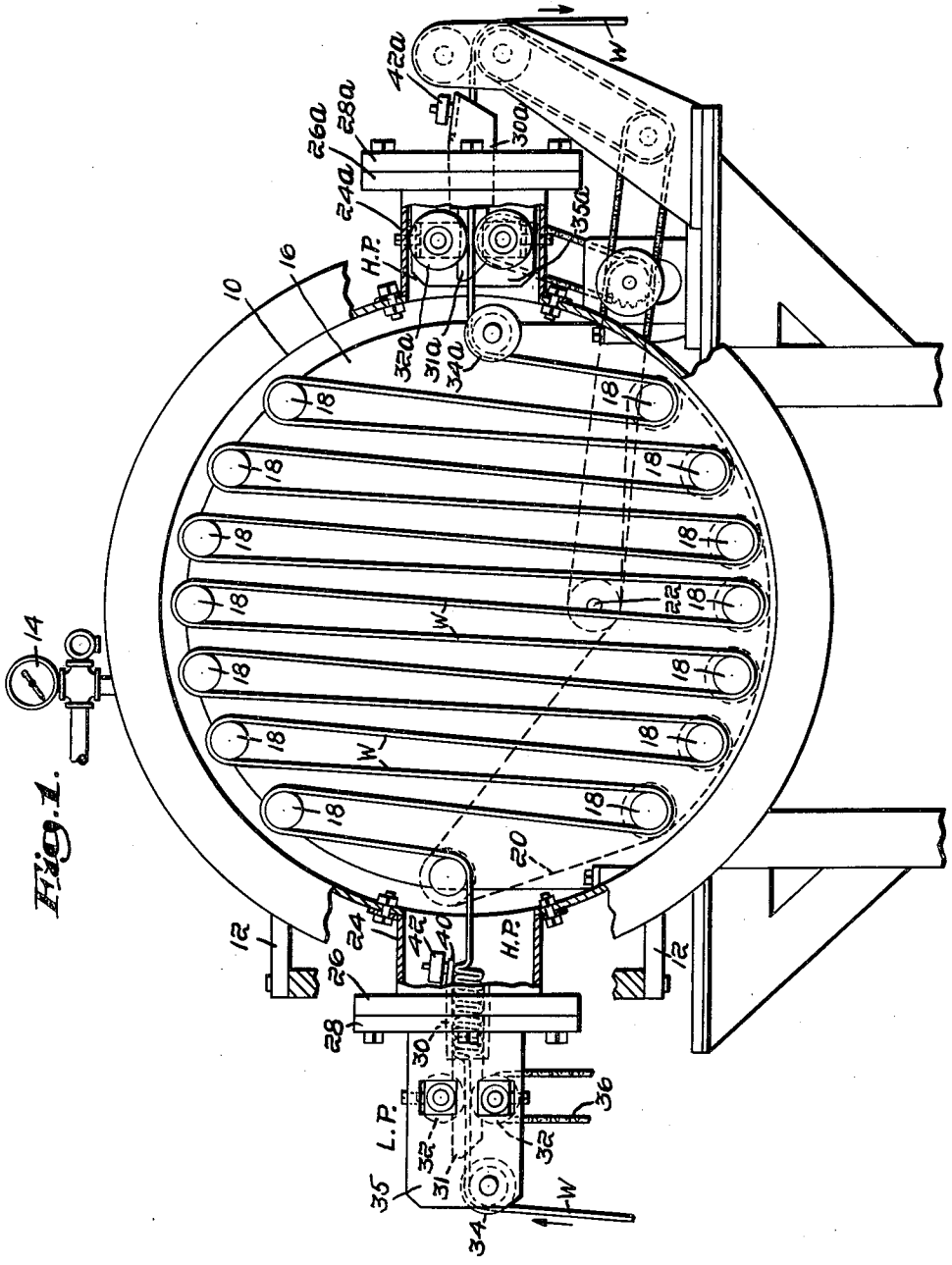


Fig. 1.

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Fig. 2.

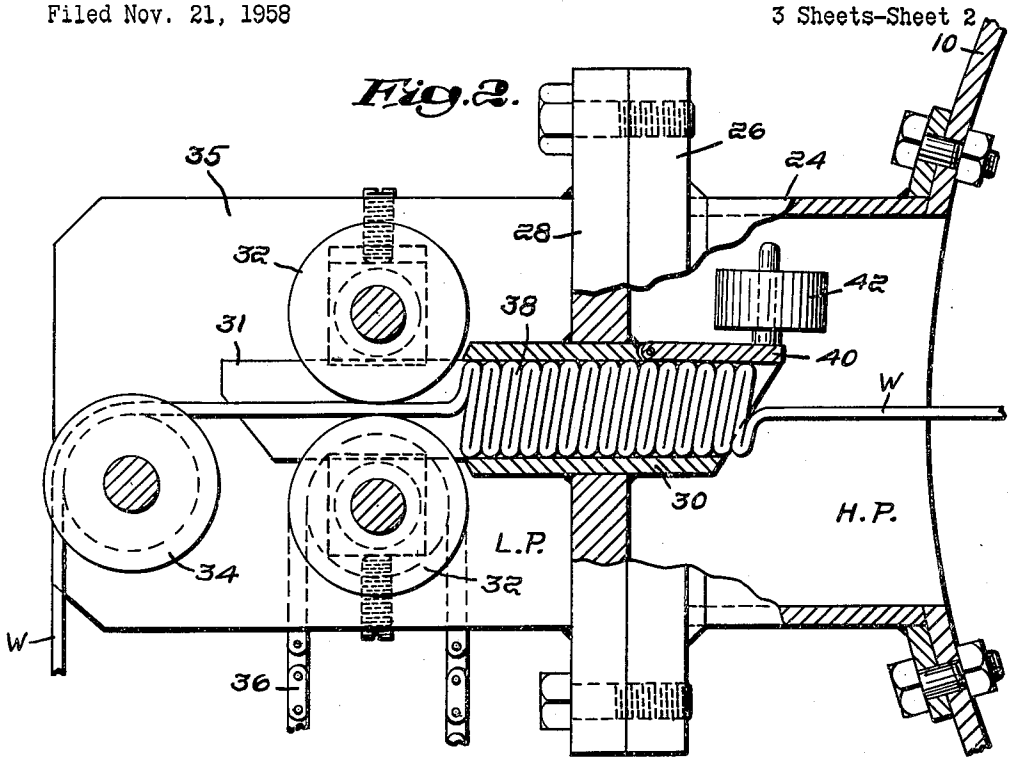
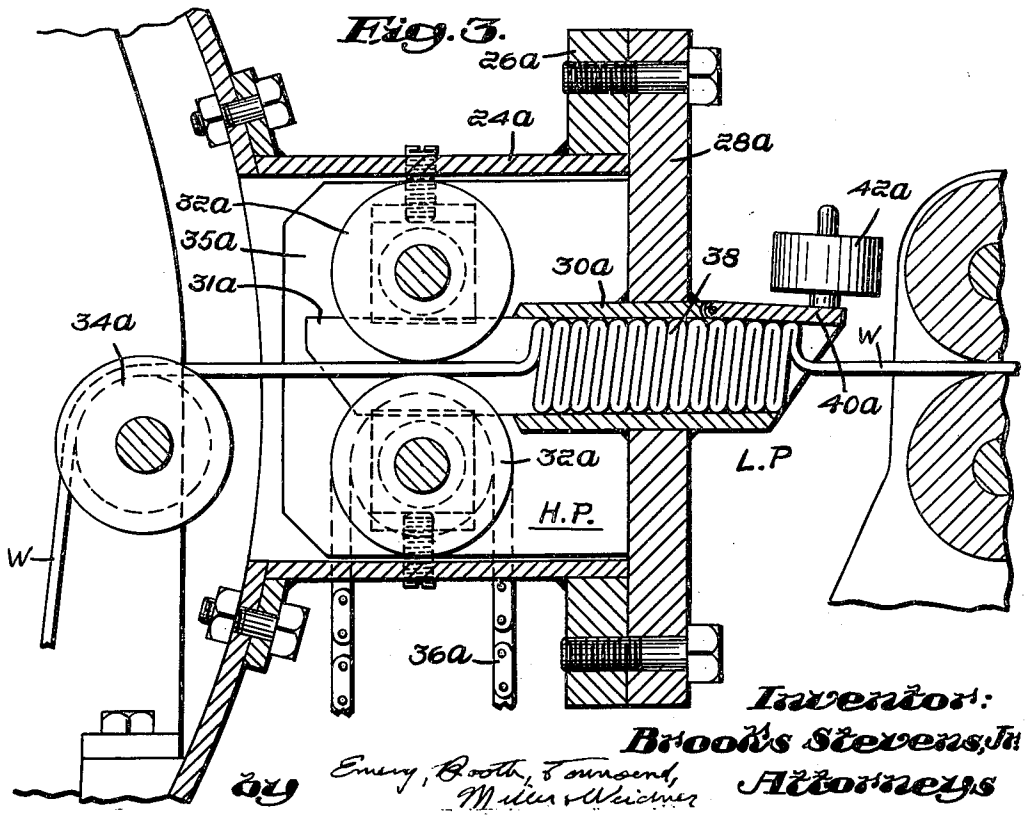


Fig. 3.



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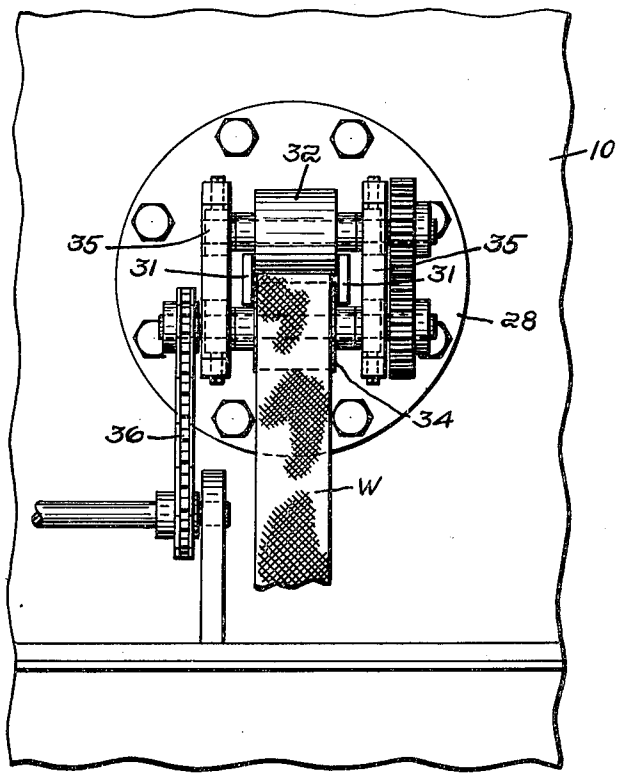
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Fig. 4.



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3,005,327

APPARATUS FOR TREATMENT OF LONG WEBS UNDER PRESSURE

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Filed Nov. 21, 1958, Ser. No. 775,590
5 Claims. (Cl. 68—5)

This invention relates to apparatus for treating materials in long lengths (webs) under conditions of non-atmospheric pressure, generally super-atmospheric pressure which may result, for example, by using steam to provide an elevated temperature, and the object of the invention is to provide an apparatus wherein the material being treated is utilized in itself to form an effective seal between regions of differing pressures.

It is often desired, particularly in the textile industry, to treat webs of material under conditions of super-atmospheric pressure. In the case of textile fabrics one purpose may be to "set" the yarns. Thus it has been proposed to knit a fabric of wool or of synthetic fiber and so treat it that the yarns themselves will be set in their looped form and have an "elastic memory" of that form and then to unravel the yarns for further use as, for instance, to provide the pile of a pile fabric which will therefore be of desirably distinctive appearance.

The apparatus to be described by way of example is suitable for such a use and for convenience it will be described with reference to that use, although the concepts involved and their application are not limited to such a use.

The invention will be understood by reference to the following description and accompanying drawings wherein:

FIG. 1 is a simplified representation of an autoclave with the door or movable closure on the nearer side removed to disclose the interior and partly broken away;

FIG. 2 is a longitudinal section with parts broken away showing the arrangement for sealing the intake through which the web enters the interior of the autoclave;

FIG. 3 is a similar view showing the exit through which the web comes out of the autoclave; and

FIG. 4 is an end view of FIG. 2 as seen from the left.

By the word "web" I refer to materials customarily produced in long lengths as exemplified by a bolt of cloth or a roll of paper and which may be sheet material woven, knitted, netted or felted or in the form of batts, all whether in extended form or rope form, and also masses of independent filaments such as slivers or yarns loosely collocated in equivalent forms.

Referring now to the drawings, I have shown there a pressure chamber **10** of the type commonly termed an autoclave (which term I will use as a convenient one) and which herein has the form of a cylinder set on its side. One base of the cylinder may be a door which is omitted in FIG. 1 to disclose the interior. Posts for the door hinges are seen at **12**. Any suitable means of customary character provides for supplying fluids to and removing them from the interior. A pressure gage **14** is shown as a diagrammatic indication of the fact that the interior may be under pressure.

Herein a plate **16** is shown installed against the interior of the further end wall of the cylinder having rollers **18** overhung therefrom about which a web W, such as a knitted tube, may be trained and certain rolls may be driven as by the belt **20** from drive shaft **22** extending through the rear base of the cylinder and suitably packed.

The web W is drawn from an exterior supply not shown, and enters at the end of the horizontal diametrical plane of the cylindrical shell at the left in FIG. 1

and goes out at the end at the right to be suitably disposed of, all of which is sufficiently clear from mere inspection of the drawing.

In accordance with the invention means are provided whereby the web at its point of entrance to the region of greater pressure or its point of exit therefrom, or both, is temporarily and locally distorted to provide a wad which blocks the passageway and forms an effective seal against the escape of pressure, which seal in practice may be transitory, but self-renewing. Herein these seals are formed by mechanism organized with adjuncts or appendages to the cylindrical wall of the autoclave at the entrance and exit points. The structures at the entrance and exist are substantially similar but are differently located as regards the regions of differing pressures in order to adapt them to their function and are slightly modified in construction to provide for their operative association with the walls of the autoclave. I shall first describe the one at the left where the web enters.

Referring to FIG. 2 there is there shown auxiliary chamber **24** in the nature of a "blister," communicating with the interior space of the autoclave, the interior volume of which chamber is in effect a continuation of that interior space and which provides a bolting flange **26** at its outer end to which is secured the end plate **28**. This plate **28** has an opening therethrough supporting a tubular passageway **30** of rectangular cross section, the passageway extending to both sides of the plate so that its ends respectively are in the two regions of differing pressure.

The horizontal width of this passageway corresponds substantially to the width of the web which is being fed in which, however, may be folded longitudinally by any suitable folding mechanism to make it effectively narrower, and the height of the passageway is substantially greater than the thickness of the web, folded or otherwise, which is to be passed therethrough.

The side walls of the tubular passageway have extensions **31** toward the left opposing the margins of the web and into the space between them project the tread portions of a pair of feed rolls **32** operating on the web as it comes from guide roll **34** and tending to push the web through the passageway. These rolls **32** are of a length closely approximating the space between these extensions (see FIG. 4) and are located closely adjacent the end of the passageway so that the web will not buckle before entering. The bearings for the rolls are carried by extensions **35** from the plate **28** and the rolls are driven at an adjustably variable speed from a suitable shaft by a sprocket chain **36**. At the other side of the plate and in the region of higher pressure, means are provided for retarding the web so forwarded, with the result that the intervening portion of the web is upset into gathers **38**, as seen in FIG. 2, which pile up in the passageway, occluding the same and forming an effective seal against the release of fluid from the interior. The retarding means are herein shown as a hinged flap **40** at the end of the passageway, carrying a suitable weight **42**. The regions of relatively high and relatively low pressure are respectively marked H.P. and L.P. on the drawing.

The mechanism at the exit side (at the right of FIG. 1) and shown in FIG. 3, is essentially like that at the left, but differently positioned relative to the shell of the autoclave. Similar parts are designated by the same numerals with the letter *a* added. In this case, however, the feed rolls **32***a* are in the high pressure region and the retarding means in the low pressure region (exterior atmosphere). While it might be possible, particularly by moving over the greater part of the length of the tubular passage **30***a* beyond the plate **28***a* and placing the feed rolls **32***a* correspondingly nearer thereto, to install the

rolls within the shell of the autoclave and take their drive from shaft 22, in which case the adjunct to the exterior of the autoclave wall which provides the bolting flange 26*a* for securing the plate 28*a* would be of shallow extent, it is here shown of such depth that the feed rolls 32*a* are accommodated therein exteriorly of the contour of the shell of the autoclave and may be driven by a shaft extending through the wall of this auxiliary chamber to the outside and suitably packed. The retarding means comprising flap 40*a* are at the exterior and require no housing.

One mode of operating the mechanism disclosed might be the following. A suitable leader web could be entered into the autoclave at the left and trained around the rollers 18 where they are present and through the exit passage, and the feed rolls operated to provide a seal in each passage. The door would then be closed, any desired fluids admitted and the autoclave brought up to pressure. A web to be treated would be attached to the end of this leader and thus drawn through the system, the seals dissipating at one end but renewing themselves at the other during the travel of the web. If the motion were continuous the time of treatment would depend upon the length of material inside the chamber and the speed. If desired the motion could be stopped for a time. Further webs could be attached to the first one and finally a trailer attached to the end of the last web would permit the complete withdrawal of the latter from the chamber, and the trailer would then provide the seals and might be utilized as a leader for another operation.

With a suitable type of pressure container the period of rest might be such that we would in effect be operating on a batch system on goods allowed to accumulate in the interior.

Other methods of operation utilizing one or another of the two seals, or their use in correlation in another manner, will suggest themselves.

I am aware that the invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof, and I therefore desire the present embodiment to be considered in all respects as illustrative and not restrictive, as is in fact clear in several matters from the description itself. Reference is to be had to the appended claims to indicate those principles of the invention exemplified by the particular embodiment described and which I desire to secure by Letters Patent.

I claim:

1. An apparatus for treating webs under conditions of non-atmospheric pressure comprising a chamber to receive and retain pressure fluid and having at least one access passage through a wall thereof in the form of a tubular passageway of a width nicely to pass the web extended as a substantially flat band and of a height exceeding the thickness of the band, feeding means for pushing the web through the passageway and means spaced therefrom at the delivery side thereof for retarding the travel of the web so that the intervening portion of the web is upset into gathers occluding the passageway against release of fluid from the interior of the chamber.

2. An apparatus as set forth in claim 1 wherein there is both an inlet and outlet access passage whereby a web may be fed through the chamber for treatment under pressure in a continuous process.

3. An apparatus as set forth in claim 1 wherein the feeding means comprises a pair of feed rolls and the retarding means a hinged pressure plate the free end of which lies on the web.

4. In combination with a wall between two regions of differing pressure an elongated passageway through the wall to pass a web and means associated therewith for operating on spaced points along the portion of the web within the passageway to press those points together so that the intervening portion forms a wad substantially filling the passageway which prevents equalization of the pressures.

5. An apparatus for treating material in long lengths comprising a chamber defining regions of different pressure within and without the same respectively and having at least one access passage through a wall thereof in the form of a tubular passageway having an intake end portion nicely receiving the material but with a clearance in one dimension, feeding means for pushing the material through the passageway, the passageway at a location remote from its intake end being of restricted dimension to bear on the material and retard the same so that the portion thereof which is within the passageway is upset to form a wad substantially filling the passageway which prevents equalization of the pressures.

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Dedication

3,005,327.—*Brooks Stevens, Jr.*, Concord, Mass. APPARATUS FOR TREATMENT OF LONG WEBS UNDER PRESSURE. Patent dated Oct. 24, 1961. Dedication filed May 13, 1970, by the assignee, *E. I. du Pont de Nemours and Company.*

Hereby dedicates the entire term of the patent to the Public.

[*Official Gazette August 18, 1970.*]