Feb. 8, 1938. E. F. JAMES ET AL 2,107,536

MEANS FOR TREATING YARN

Filed Sept. 7, 1934 3 Sheets-Sheet 1

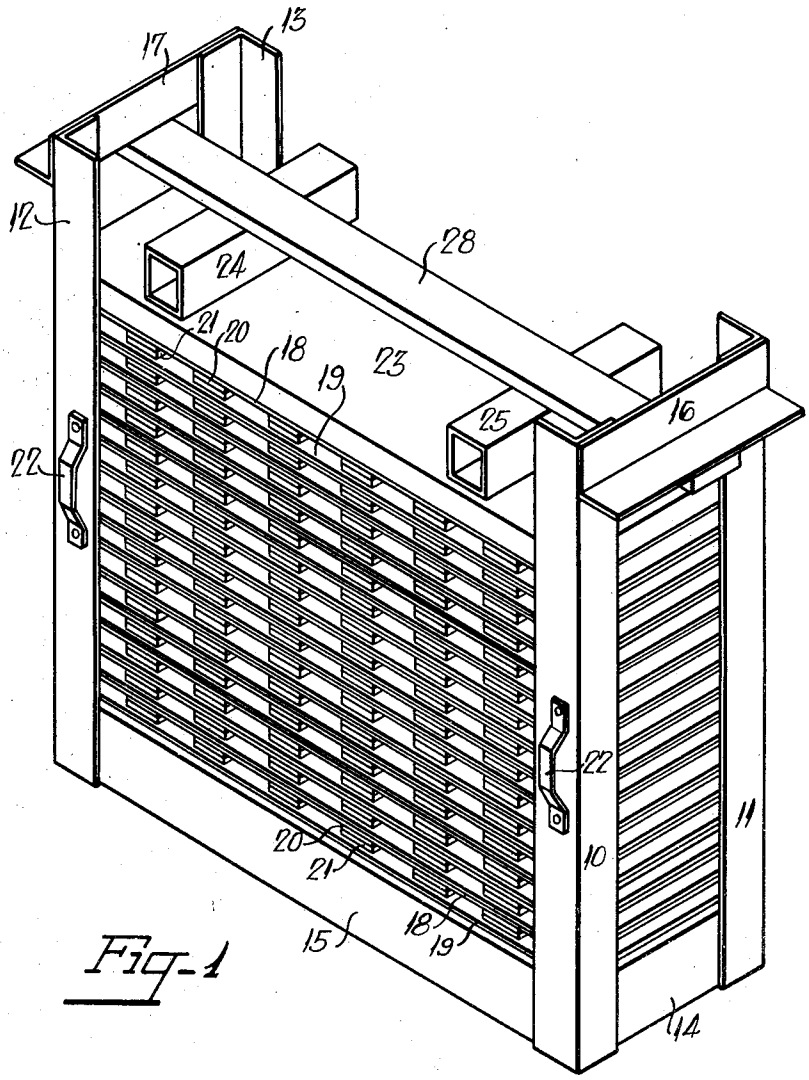


Fig-1

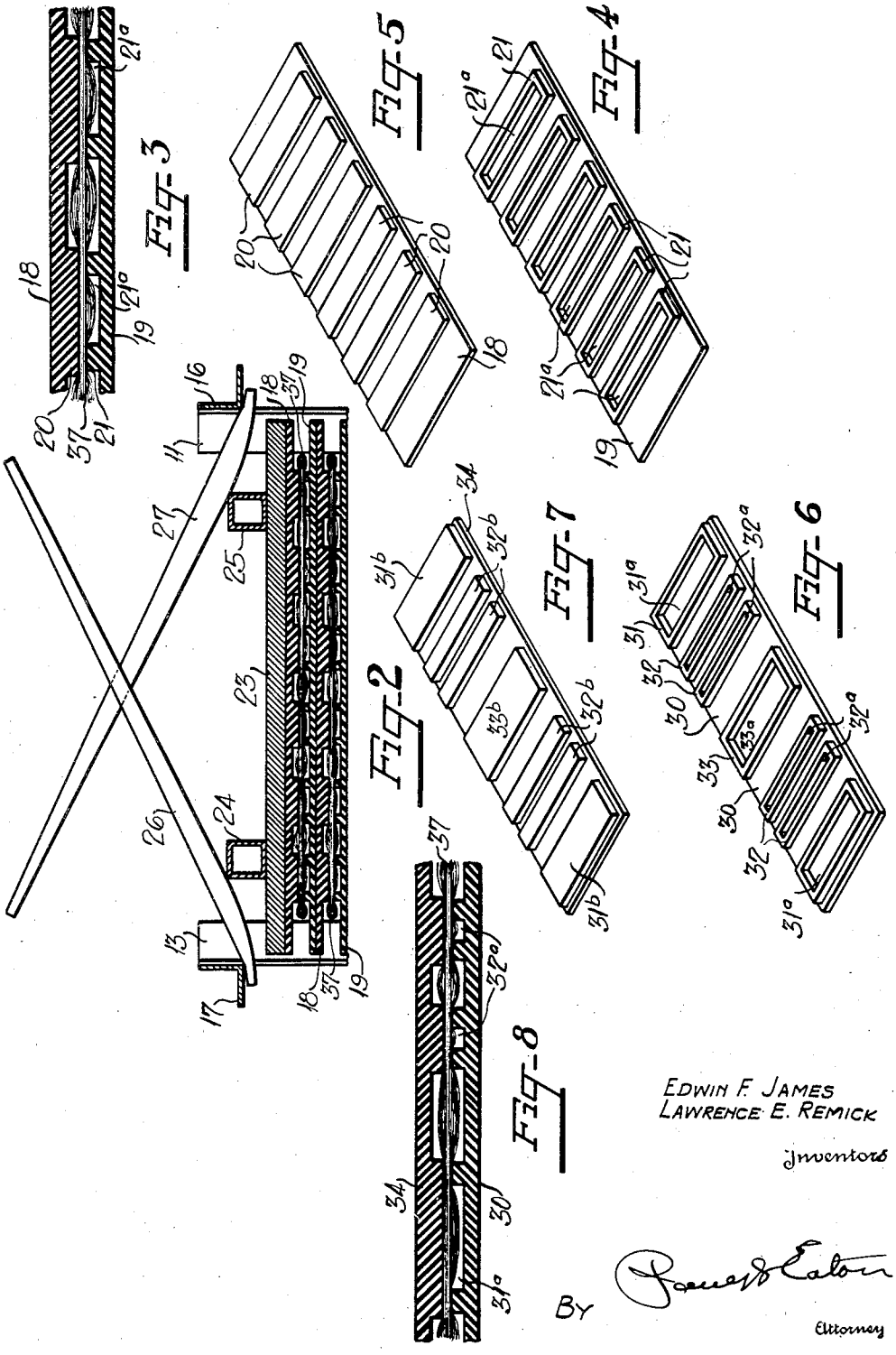
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MEANS FOR TREATING YARN

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MEANS FOR TREATING YARN

Filed Sept. 7, 1934 3 Sheets-Sheet 3

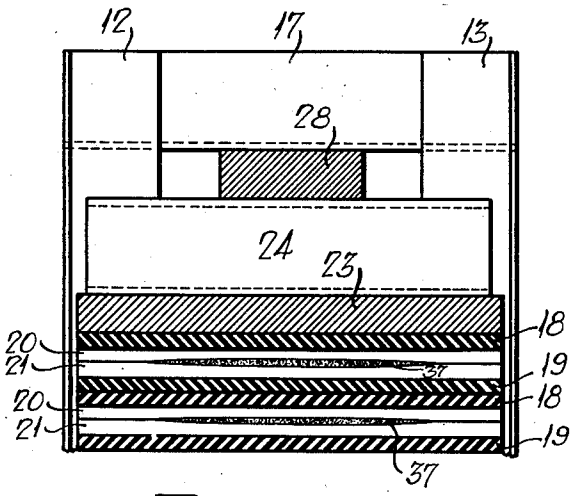


Fig-11

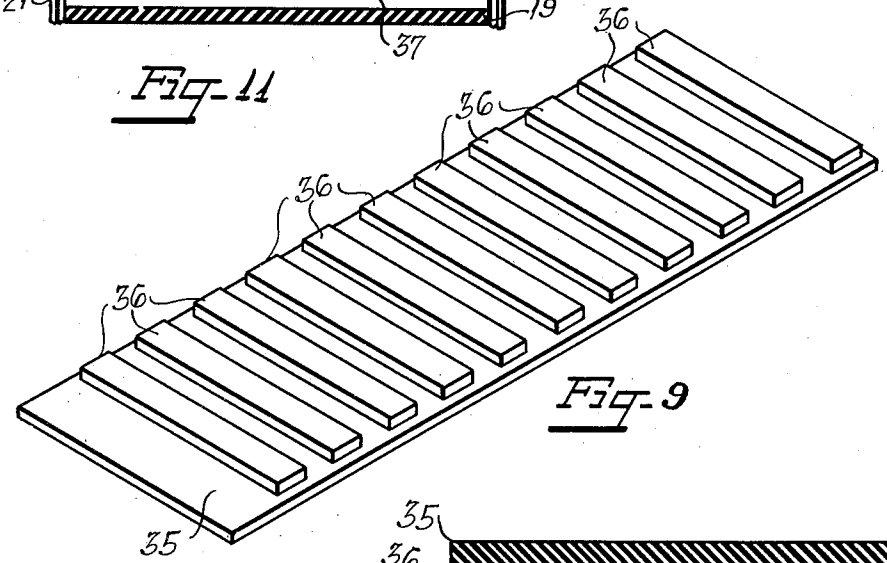


Fig-9

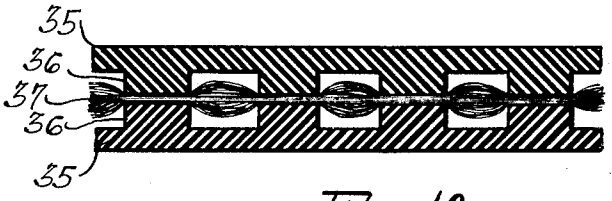


Fig-10

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Patented Feb. 8, 1938

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UNITED STATES PATENT OFFICE

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MEANS FOR TREATING YARN

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Application September 7, 1934, Serial No. 743,108

1 Claim. (Cl. 8—7)

This invention relates to a method and means of treating skeins of yarn with a chemical to cause yarn to be affected in a different manner by certain dye-stuffs than it would be affected were it not treated.

More specifically, the method and means relating to the spot treatment of portions of skeins of yarn and leaving other portions untreated or treated to a less degree so that when the skeins of yarn are dyed, or the fabric containing the yarn is dyed, the dye will affect the untreated or partially treated portions in one manner and affect the treated portions in another manner, either completely dyeing some of the portions, staining some of the portions and leaving the other portion unaffected or affected to a lesser degree by the dye.

The invention particularly relates to the treatment of cellulose esters which is cellulose acetate and the unclamped or uncovered portions of the yarn are subjected to a bath which saponifies the portions which are subjected to the bath and changes the cellulose acetate to a regenerated cellulose so that, for example, when the yarn, whether in skein form or in manufactures thereof, is subjected to a dye bath for cellulose acetate, the cellulose acetate portions of the yarn will be dyed whereas the regenerated portions will not be dyed or by the selection of a suitable dye, the cellulose acetate portions will be dyed to a certain degree, either partial or complete, and the regenerated cellulose portions will be dyed either partially or completely or not dyed at all.

We have found that the skeins of yarn when clamped in position in the apparatus, to be hereinafter explained, or suitably covered, is subjected to a chemical bath at a temperature of approximately 100 degrees centigrade, in the approximate portions 150 to one, that is the chemical bath containing approximately three grams of sodium hydroxide or some similarly acting alkali to each litre of water, that the portions of the yarn which are exposed to the bath are saponified and changed into a regenerated cellulose within about two and one-half minutes, whereas the portions which are completely clamped or covered by the clamping or covering members are unaffected by the bath and retain the characteristics of a cellulose acetate. A shorter period of treatment would affect the yarn less and cause the treated portions to be less receptive to dyes than if the treatment were for a longer period.

By a longer treatment it is possible to bring the saponification of the treated portions to a point which so completely changes the treated portions to regenerated cellulose as to permit dyeing of untreated portions with S R A and similar dyes, into distinct contrast to the direct or cotton dyes used on the treated portions. It is evident that the longer the treatment of the fibers in the bath, the greater tendency there is to weaken the yarn and a short period of treatment permits use of the process on the finest dernier whereas, the longer treatment restricts the operation somewhat to heavier dernier.

It is evident that the clamping or covering members can be made of any desirable material, which will not be rapidly affected and will produce no detrimental reaction when they are immersed in a chemical bath along with the clamped or covered skeins of yarn. The pads can be either solid or resilient or semi-resilient and can be made of hard rubber, resilient rubber, a suitable metal or any desired composition.

It is evident that a resilient pad is preferable where a complete shielding of the clamped or covered portions is necessary but a rigid pad can be used where it is desired that a certain amount of leakage of the treating solution will occur between the clamps to partially treat the clamped or covered portions as well as the unclamped or uncovered portions and therefore, the resiliency of the pads can be determined by the specific resultant product which is desired.

By the selection of the proper materials for the clamping or covering members, it is possible to accomplish a treatment which varies from complete shielding or covering of portions of the yarn down to a partial saponification of the protected sections of the yarn and a slightly greater saponification of the sections which are not held between the clamping or covering portions of the clamping or covering members. In view of this, it is evident that a felt pad or a very resilient pad would give a broken edge at the division point between the clamped or covered portions and the unclamped or uncovered portions and therefore the material selected for making the clamping or covering members will be determined by the sharpness of the division line desired between the treated and untreated portions of the yarn.

It is an object of this invention to provide means for clamping or covering portions of skeins of yarn and immersing the complete skein of yarn in a suitable bath of suitable chemicals so that the unclamped, uncovered or exposed portion of the skein will be affected by the chemical bath while the portions which are clamped or covered will be unaffected by the chemical bath. It might be stated that the clamping or covering can be so adjusted, if desired, as to allow seepage of the

chemical treating solution in any desired manner to a portion of the yarn held in clamped or covered relation, so as to vary the degree or intensity of the treatment.

It is another object of this invention to provide means for clamping or covering a skein of yarn between a plurality of clamping or covering members and leaving portions of the yarn unclamped or uncovered and having other portions of the yarn clamped or covered or shielded to prevent its being affected by a chemical bath or affected to a lesser degree than the clamped, covered or shielded portions and then by immersing the complete apparatus and skeins of yarn into the chemical bath to treat the portions of yarn which are not clamped or covered or shielded to cause them to be affected in a different manner when the entire skein is subjected to a dye bath. This skein can be subjected to a dye bath after treatment or can be woven or knitted or otherwise fabricated into suitable manufactures and the completed manufactures can be subjected to a dye bath which will result in beautiful cross-dyeing effects and the pattern produced by the cross-dyeing effect can be regulated by the position of the clamping or covering members with relation to each other and the amount of the yarn which is left in the unclamped or uncovered position and therefore affected by the chemical bath.

It is a further object of this invention to saponify portions of yarn made of or containing esters of cellulose and leaving other portions of the yarn affected to a less degree than the portions which are saponified.

A further object of this invention is to partially saponify portions of yarn made of or containing esters of cellulose such as cellulose acetate in such a manner that different portions of the yarn will possess different dyeing properties.

A further object of this invention is to saponify portions of yarn made of organic esters of cellulose so that this yarn can be used for the manufacture of fabrics and articles such as hose, articles of wearing apparel, and the like, which present a cross-dyed effect from such treated yarns whether the yarn is dyed before being manufactured into the fabrics or articles or whether it is dyed after it is manufactured into the fabrics or articles.

Some of the objects of the invention having been stated, other objects will appear as the description proceeds when taken in connection with the accompanying drawings, in which:—

Figure 1 is an isometric view of an apparatus suitable for practicing our method;

Figure 2 is a vertical sectional view of the upper portion of the apparatus taken immediately behind the two side posts shown in Figure 1 and showing the apparatus before the pads are moved to clamping or covering position;

Figure 3 is an enlarged detail view of a portion of the clamping or covering means shown in Figure 2;

Figure 4 is an isometric view of the bottom pad of a plurality of sets of pads used for clamping, covering or shielding the skeins of yarn;

Figure 5 is an inverted isometric view of the top pad for fitting down on the bottom pad shown in Figure 4 for clamping and shielding the skeins of yarn;

Figure 6 is an isometric view of another type of bottom pad;

Figure 7 is an inverted isometric view of another type of top pad adapted to fit on the pad shown in Figure 6;

Figure 8 is a view similar to Figure 3 but showing the pads shown in Figures 6 and 7 in operative position with the skeins of yarn therebetween;

Figure 9 is an isometric view of another type of pad, the top pad being identical to the bottom pad in this form;

Figure 10 is a longitudinal sectional view through a pair of pads made according to Figure 9 and showing a portion of a skein of yarn in clamped position;

Figure 11 is a transverse sectional view through the upper portion of the apparatus showing the clamped or covered portion of the yarn.

Referring more specifically to the drawings, **10** and **11** indicate a pair of angle iron uprights forming one end of the apparatus and **12** and **13** indicate the uprights for the other end. These uprights are joined by means of a bottom angle member **14**. The uprights **10** and **12** and **11** and **13** respectively are joined by an angle member **15**. At the top end of the angle members **10** and **11** a transverse angle member **16** is secured, and at the top portion of posts **12** and **13** there is secured therebetween angle member **17**. All of these parts are secured together preferably by welding to make a rigid framework.

Into this framework a plurality of pairs of pads or clamping or covering members are adapted to be placed with the proximate faces of the clamping members having raised portions thereon, which raised portions serve to clamp, cover or shield portions of a skein of yarn disposed therebetween. In Figure 1 these pairs of clamping covering or shielding members are indicated by reference characters **18** and **19** and the raised portions thereon are indicated by **20** and **21** respectively. Each of the uprights **10**, **11**, **12**, and **13** has a suitable ear **22** thereon beneath which a suitable hook can be secured for immersing the mechanism in the treating bath as will hereinafter be explained.

After the apparatus is packed with the skeins of yarn between the pairs of pads, a suitable rigid member, such as a board **23**, is placed on top of the uppermost pad and a pair of members **24** and **25** are placed on top of this board **23** and then a pair of levers **26** and **27** are placed in the position shown in Figure 2, that is, usually one lever on each side of the apparatus to exert downward pressure on the members **24** and **25** to move the board **23** downwardly to press the clamping members toward each other to clamp the yarn. When the board **23** and the members **24** and **25** are moved downwardly far enough by pressure on levers **26** and **27**, a rigid member, such as a piece of metal **28** of sufficient strength, is placed beneath members **16** and **17** to hold the pads or clamping members in clamped position. It is evident that the degree of pressure to be applied can be regulated by the selection of blocks **24** and **25** of varying thicknesses.

In assembling the apparatus as shown in Figure 1, a pad **19** is laid in the bottom of the apparatus and in the form of the pad shown in Figure 4, the portions **21** have a cavity **21***a* therein, and a skein of yarn is laid, preferably in spread out position, on top of the member **19** shown in Figure 4, and then the top clamping member shown in Figure 5 is inverted from the position shown in Figure 5 and is laid on top of the member **19** and then additional sets of members **19** and **20** are placed one above the other as shown in Figure 1 with a skein of yarn therebetween until the

desired number of sets of clamping members and skeins of yarns have been placed therein.

It is evident that the amount of pressure under which the clamped portions of the yarn are held may be varied also by varying the number of sets of members 18 and 19 which are placed in the apparatus as well as by selection of the thickness of blocks 24 and 25.

In Figures 6 and 7 a different form of clamping members is shown in which the bottom member 30 has a plurality of differently shaped raised portions 31 and 32, the raised portion 31 being broader than the raised portion 32 and each of these members has cavities 31*a* and 32*a* therein. If desired, a much broader portion 33 with the cavity 33*a* therein, may be provided, and, of course, a top member 34 is provided having raised portions 31*b* and 32*b* and 33*b* thereon made of a size to conform to the raised portions on member 30 with which they are to coincide and of course a skein of yarn will be disposed between members 30 and 34. These cavities cause a gripping effect between the clamping members on account of a partial vacuum being created therein.

In Figure 9 a slightly different form of the clamping member is shown indicated by reference character 35 having raised portions 36 spaced apart from each other thereon, and in this form the top and bottom members, between which the skein of yarn is placed, are identical to each other as shown in Figure 10, a skein of yarn in all figures being indicated by reference character 37. It should be noticed that the types of pads shown in Figures 4 to 7 inclusive, are the vacuum type, that is, the recesses 21*a*, 31*a*, 32*a*, and 33*a* contain the portions of yarn which are not subjected to the treatment. When the apparatus is immersed, the air in the recesses expands and tends to prevent the treating solution from contacting the portion of yarn in these recesses.

The various forms of the clamping members or pads are shown to illustrate that these clamping members may be arranged in any desired manner to produce any desired treatment of the skeins of yarn, that is, by leaving exposed any desired length of the skeins so that various cross-dyeing effects can be obtained when these treated skeins are later subjected to a dye bath.

When the apparatus is packed full of clamping members and skeins of yarn as shown in Figure 1, the preferred form of treatment is to immerse the entire apparatus in a treating solution and this is usually done by inserting hooks attached to suitable ears 22 or beneath members 16 and 17 and lowering the apparatus into the treating bath. When the apparatus as shown in Figure 1, is entirely immersed within the bath for a desired length of time it is removed and rinsed in luke-warm water and unpacked and the skeins of yarn are removed therefrom and another set of skeins of yarn are placed in the apparatus and rinsed in water which is slightly acidified by any suitable acid, such as acetic acid, and then rinsed in plain water.

The apparatus full of skeins is again ready for lowering into the treating bath. This type of treatment treats all portions of the exposed portions of the skeins in the same manner but if desired the apparatus may be handled in a different manner, that is, by causing hooks to engage beneath the straps 22 at one end of the apparatus, and a portion of the apparatus may be lowered into the treating bath for a given length of time and then the remaining portion may be immersed and of course this will give a different degree of saponification to that portion which was first immersed into the treating bath.

If desired only a portion of the apparatus, that is one end of the apparatus as shown in Figure 1, may be lowered into the treating bath and the other portion not subjected to the treating bath at all which gives still a different effect, or if desired, one end of the apparatus can be lowered into the treating bath and can be removed therefrom and the hooks engaged in the other end of the apparatus with the other end lowered into the bath a short distance, to treat both ends of the skein and not treat the center portion, or if desired, both ends of the skein can be treated as above described, and then the entire apparatus can be lowered completely into the bath to submerge all portions of the skein which will cause the end portions of the skein to be treated a greater degree by the treating fluid than the central portion thereof. The above examples are given to show the various forms in which the apparatus may be used to produce a desired degree of saponification to the desired portions of the skeins of yarn to produce the desired cross-dyeing effect when the yarn is later subjected to the dyeing operation, either in the skein form or in the fabric from which the manufactured article is made from the yarn in an undyed form.

In the drawings and specification there has been set forth a preferred embodiment of the invention, and although specific terms are employed, they are used in a generic and descriptive sense only, and not for purposes of limitation, the scope of the invention being set forth in the appended claim.

We claim:

Means for holding skeins of yarn for treatment in a treating bath comprising an elongated flat member which is longer and broader than a skein of yarn, an endless projection on one side of the flat member forming an enclosure, a second member of approximately the same size as the first member and adapted to lie on top of the first member after a skein of yarn has been spread on top of the first member and means for pressing the two members together to shield the portions of yarn disposed within said enclosure from the effects of a treating bath when the members and the yarn are immersed in a treating bath.

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