Nov. 3, 1936. R. K. BOADWEE ET AL 2,059,307

FABRIC INSPECTING APPARATUS

Filed June 10, 1933 3 Sheets-Sheet 1

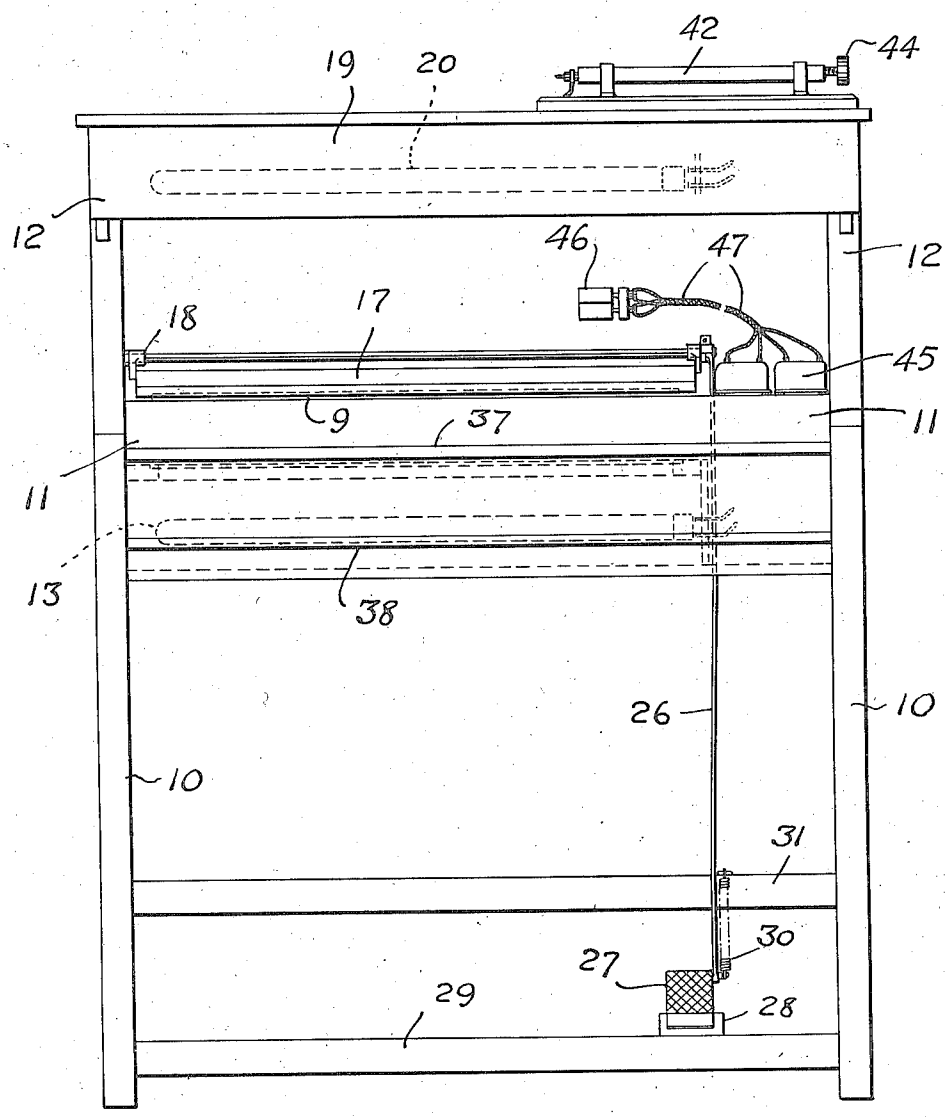


Fig. 1.

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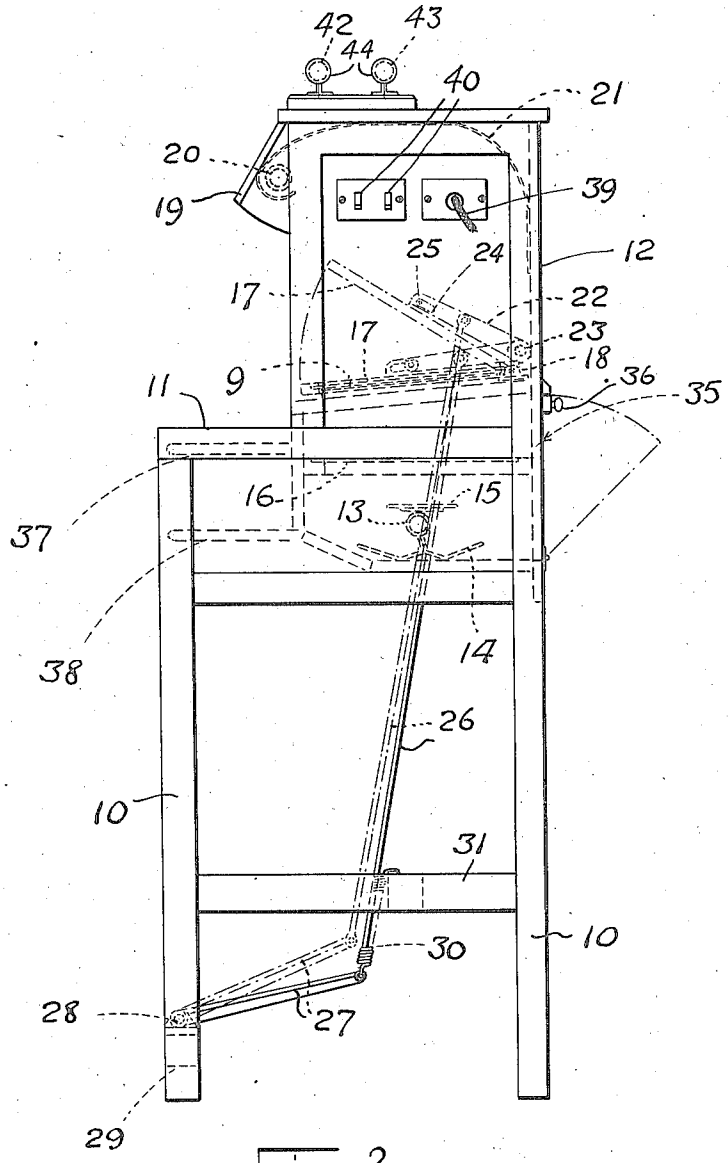


Fig. 2.

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Fig. 3.

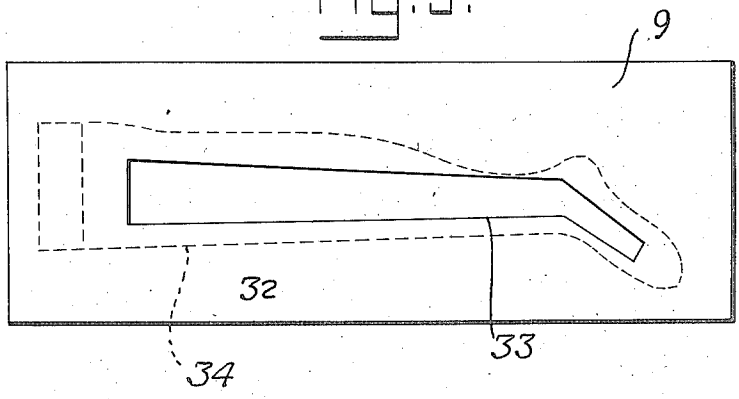
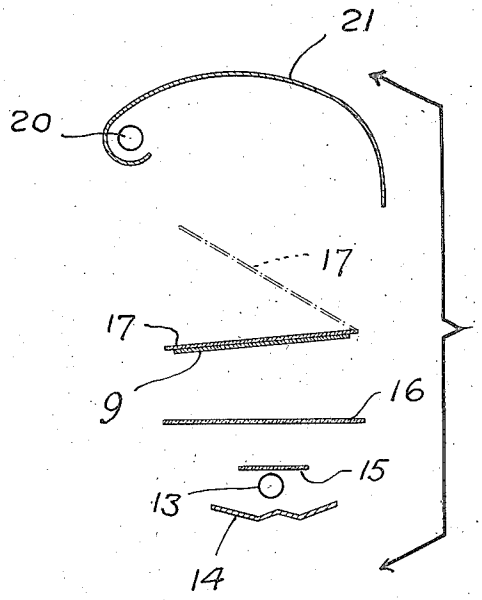


Fig. 4.



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FABRIC INSPECTING APPARATUS

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Application June 10, 1933, Serial No. 675,288

3 Claims. (Cl. 88—14)

This invention relates to apparatus for inspecting, examining or grading knitted or woven fabrics and more particularly knitted hosiery.

In the knitting of sheer or fine-gage hosiery the unavoidable variation in the thickness of the thread frequently results in the formation of streaks or bands extending from side to side of the stocking blank or around the leg of the wearer, and in practice it is usually necessary to discard an appreciable number of stockings due to these objectionable streaks or bands. It has heretofore been usual to examine such goods by holding them up to the light or over a white surface which magnifies the streaks or bands due to the passage of light and because the fabric is double and it frequently happens that stockings are classified as irregulars and are discarded although the streaks or bands would not actually have been apparent on the leg.

One object of our present invention is to provide an improved apparatus whereby stockings and other like articles may be inspected and graded in such a manner as to eliminate only such stockings as would be objectionable on the leg.

A further object of the invention is to provide means whereby the inspector is unable to observe slight unevennesses or indistinct bands that would not be objectionable in use and can observe only such unevennesses or bands as would render the stockings objectionable.

A still further object is to provide apparatus whereby the double thickness of the stocking or other like article may be examined without showing the usual more or less moire effect that is ordinarily apparent due to the loops crossing each other at irregular points when two thicknesses of knitted fabric are superimposed upon each other.

Still another object of our invention is to employ means whereby the unevenness test is standardized and whereby such test is more severe at those parts of the stocking where greater evenness is desirable.

With these and other objects in view, our invention consists in the novel construction and arrangement hereinafter described, illustrated in the accompanying drawings and particularly pointed out in the appended claims, it being understood that various changes may be made without departing from the spirit of the invention or sacrificing any of the advantages thereof.

In the drawings, Fig. 1 is a front view of the apparatus; Fig. 2 is a side view of the same; Fig. 3 is a detail plan view of the supporting plate or table; and Fig. 4 is a diagrammatic section showing the relative positions of the lights and screens.

The apparatus shown at Figs. 1 and 2 comprises four uprights 10 supporting a frame 11 and an upper cabinet 12. Suitably supported on brackets or ledges in the cabinet 12 is a fixed plate 9 consisting of a screen which is preferably tinted and beneath which is mounted an electric lamp 13 extending substantially the full width of the cabinet or apparatus. Beneath the lamp 13 there is arranged a reflector 14 and between the lamp 13 and the plate 9 there is arranged a light diffusing screen 15 and between this screen 15 and the plate 9 there may be interposed a screen 16 of "Pinklite flash glass" in order to ensure an even distribution of light on the underside of the translucent plate 9. The commercially known "Pinklite flash glass" is a pink tinted glass flashed on one side with white opal, the white opal screening out the minor details of the tested stocking, diffusing the light rays and accentuating the objectionable lines and bands, while the tinting of the glass is for the purpose of screening off both extremes of the visible spectrum, or the violet, blue, and red rays, to obviate the necessity of changing the screen for the inspection of different color hosiery.

Above the plate 9 there is mounted a hinged plate 17 with its hinges 18 arranged at the rear edge so that it may be turned upwardly as shown in dotted lines at Fig. 2 to permit convenient spreading upon the plate 9 of the stocking or other article to be inspected. In the front portion 19 of the cabinet 12 there is mounted an electric lamp 20 extending substantially the full width of the cabinet and the light from this lamp is thrown onto the upper surface of the hinged plate 17 by means of a suitably shaped reflector 21 so that the light from the lamp 20 is uniformly distributed over the upper surface of the plate 17 which may be of suitable translucent material and the light values are so regulated that the inspector—observing the object through the plate 17—is unable to detect minor streaks or bands and in practice the inspector discards all articles in which any streaks or bands are visible through the plate 17.

By decreasing the power of the lamp 20 or by increasing the power of the lamp 13 or by both these changes a greater number of unevennesses or bands become visible through the plate 17 and the light values can be regulated to any given standard so that the inspection results in the discarding of only such goods as fail to reach a definite and predetermined standard and the dis-

cretion or judgment of the inspector is no longer relied upon to decide when a doubtful object may or may not be passed.

For raising and lowering the plate 17 there is provided an arm 22 hinged at 23 and having a slot 24 engaging a pin 25 on the plate 17 and the arm 22 is connected by means of a rod 26 to the rear end of a treadle 27 whose front end is hinged at 28 on a cross bar 29 between the front uprights 10 of the apparatus, and the treadle 27 is normally held upwards by means of a tension spring 30 extending between the rear end of the treadle and a cross frame 31 so that the plate 17 is normally in its raised position thus allowing free access to the plate 9 so that the inspector may spread the stocking or other object upon such plate and then lower the member 17 upon the said object by depression of the treadle 27. The object is then viewed through the plate 17 and after this inspection the treadle is released to permit the plate 17 to rise and allow convenient withdrawal of the object to be passed as satisfactory or condemned as a "second" or "irregular".

Referring particularly to Fig. 3 the plate 9 is formed with a mask or opaque portion 32 leaving the exposed portion 33 of the form shown. In this figure the dotted lines 34 show a stocking in position for inspection with the unmasked portion 33 coinciding with the portion of the stocking to be inspected.

An important feature of our invention is the adjustment of the light values to give any desired grade or standard and so that the inspector invariably detects unevenness or bands of a certain predetermined degree.

The object supporting plate 9 and the covering plate 17 may be made of any suitable translucent glass or like material but we have found in actual practice that a pink tinted screen gives very satisfactory results and can be employed with complete satisfaction when inspecting or grading black or white goods or goods of any shade or color.

The back of the cabinet 12 may be provided with a rear hinged panel 35 having a catch 36 so as to give convenient access to the space beneath the fixed plate 9, and at the front of the cabinet an upper shelf 37 and a lower shelf 38 may be provided for the accommodation of the articles being graded or other suitable or convenient brackets, racks or supports may of course be provided.

For the supply of electric current for the lamps 13, 20, a flexible lead 39 enters the machine and is connected through individual switches 40 to the lamps 13, 20 and through carbonpile rheostats 42, 43 mounted on the top of the cabinet and each of these rheostats is provided with a control knob 44 so that the power of each of the two lights may be independently regulated.

In actual practice it is desirable to subject to a stricter examination the portion of the stocking visible through the right hand end of the part 33 in Fig. 3 and for this purpose the lights 13, 20 are so made or arranged—or either of them may be so made or arranged—that this result may be obtained. In practice the portion of the light 13 at the right-hand side may be brighter than the portion at the left hand side or the light 20 may be brighter at the left hand side and dimmer at the right hand side, or the light values of both lamps may be varied in this way in order to ensure that the test at the left hand extremity of the opening 33 is less severe than the test at the right hand extremity of the same.

Referring to Fig. 1 of the drawings, galvanometers 45 are provided and in conjunction therewith two photronic cells 46 are employed for the adjustment of the apparatus to the proper light values. The cells 46 being mounted on a flexible connection 47 and being used to gather the light rays and transmit them to the galvanometers 45 for measurement.

In actual practice the lights are regulated to suit a desired standard of goods and the inspector passes only such goods as fail to disclose to her any streakiness or bands when viewed in the manner above described. The same apparatus or a similar apparatus may be differently adjusted so that discarded articles may be segregated into "seconds" and "thirds". The inspection in this case being carried out in exactly the same way but with the light values adjusted to a different standard or grade.

Although the drawings and above specification disclose the best mode in which we have contemplated embodying our invention, we desire to be in no way limited to the details of such disclosure, for in the further practical application of our invention, many changes in the form and arrangement may be made as circumstances require or experience suggests without departing from the spirit of the invention within the scope of the appended claims.

What we claim is:

1. A cabinet for use in the inspection and grading of hosiery and other like articles comprising a colored translucent plate for supporting the article to be tested, a similar plate hinged above the first mentioned plate, means for swinging the second plate into position over the article spread upon the first plate, an electric lamp for illuminating the lower plate, a diffusing screen between said lamp and said plate, means for indirectly illuminating the second plate and means for regulating the light values above and below said plates to ensure detection by the inspector of only a certain degree of unevenness in the article being inspected.

2. A cabinet for use in the inspection and grading of hosiery and like articles comprising a colored translucent plate for supporting the article to be tested, a similar plate hinged above the first mentioned plate and movable into position over the article spread upon the first plate, an electric lamp for illuminating the lower plate, a diffusing screen between said lamp and said plate, means for indirectly illuminating the second plate, and means for regulating the light values above and below said plates to ensure detection by the inspector of only a certain degree of unevenness in the article being inspected.

3. A cabinet for use in the inspection and grading of hosiery and like articles comprising a colored translucent plate for supporting the article to be tested, a similar plate hinged above the first mentioned plate, a foot operated treadle connected to the hinged plate for moving the same into position over the article spread upon the first plate, an electric lamp for illuminating the lower plate, a diffusing screen between said lamp and said plate, means for indirectly illuminating the second plate, and means for regulating the light values above and below said plates to ensure detection by the inspector of only a certain degree of unevenness in the article being inspected.

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