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~~RESEARCH~~
R51-39
**Special Report Shows Research
By Quartermaster on Hosiery**

By Louis I. Weigner,
Textile, Clothing and Footwear Section,
Office of the Quartermaster General.

[The following article is officially described as "Textile Materials Engineering Laboratory Report No. 44" and has been furnished to Hosiery Industry Weekly by the Office of Technical Information, Office of the Quartermaster General, Department of the Army.]

Throughout the large military procurement program of World War II, and now in the midst of the present expansion of the Armed Services, close cooperation in research activities between the men's hosiery industry and the Quartermaster Corps has resulted in significant improvements in the functional performance of sockgear.

Such contributions to the com-
Continued on Page 17

**St. Louis Hose Sales
Up for 1st Quarter**

Continued from Page 3
ahead of a year ago," said the buyer for another large department store. "In fact, our main problem right now is to build up a cushion deep enough to counteract the exaggerated scare buying that took place in mid-summer of last year.

"If we continue to sell stockings for the next four months the way we have during the first four, we should enter September quite a bit ahead of last year even taking into account the scare buying period."

The sharp increase in hosiery sales that the first week of truly spring weather should have brought has not materialized. The stores simply are not crowded and busy the way one would expect them to be.

"Too many people loaded themselves with too many purchases of hard items," one buyer suggested as an explanation. "For example, if a man making \$100 a week went out during the scare buying period and bought a new car and a refrigerator, he is carrying about all he can bear. Probably one fourth of his income is going to pay for those two items. That means that his wife has to skimp a little here and there."

**Dark Shades, Novelties
Coming Into Their Own**

St. Louis, Mo.—"When the fire's hot, pour on more oil," is an old merchandising adage, and St. Louis specialty shops are doing just that. After looking at dark heels with a fishy-eyed stare for two years and more, St. Louis women are finally going for the novelty heels in a big way. And the specialty shops are doing everything possible to add impetus by featuring and pushing

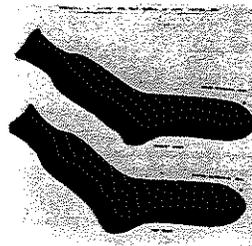


Figure 1

the fancy heels in every manner they can think of.

But whether a store emphasizes light or dark shades remains a moot question. One specialty shop will have its window full of light shades—the lighter the better apparently—and the next will display nothing except dark shades.

The answer seems to be that Mother Nature has yet to make up her mind that it's Spring, and Mrs. and Miss St. Louis are in the same quandary.

St. Louis' office girls generally prefer darker shades for wear at work. As a result, shops in the Grand Ave. and Olive St. shopping center—a neighborhood much patronized by office workers—continue to feature and push the darker shades in women's nylon hosiery, with added emphasis on dark seams and dark heels.

**Hose Class Trip
Set for Tomorrow**

Continued from Page 3
will be held in New York tomorrow. The current session's final class will be held next Tuesday, May 23, in room 1589 of the Empire State Building, Mr. Urlaub said.

The field trip tomorrow will visit plants in the Reading, Pa., vicinity, including Berkshire Knitting Mills, Infants' Socks, Inc., Wm. G. Leininger Knitting Co., and Industrial Hosiery Mills.

Special QM Report On Hose Research

Continued from Page 36.

fort and wear life of hosiery made possible by wartime and postwar military research, such as the cushion-sole sock, nylon toe reinforcements (figure 1), and the use of shrink-resistant wool for socks, may well be remembered by soldier and civilian alike long after the more spectacular exploits of warfare have been forgotten.

It is characteristic of research and development studies that new advances and discoveries indicate the necessity for further investigations and frequently suggest the avenue of approach to be followed.

Thus, with the Army Quartermaster research program, considerable work still remains to be done even though marked strides have already been made. It is the purpose of this short review to highlight some of the necessary areas for research and to point out possible avenues of approach.

One of the unheralded advances in the military hosiery program that did much to mitigate the supply problems during World War II, as well as to simplify production for contractors, was standardization of hosiery types among the various using services and reduction to the bare minimum of the number of models procured.

The Quartermaster Corps now purchases only three types of men's socks: the sock, cotton, tan, for garrison wear; the sock, wool, cushion-sole, for general and combat use; and the sock, wool, winter (ski sock) for cold weather.

Reduction in the number of types beyond these three does not seem likely in the foreseeable future, and would probably be considered only in the event of the development of completely new theories and principles regarding the nature of footwear for military use.

From a functional standpoint, the most critical parameters of hosiery have always been comfort and fit.

Under the heading of comfort is included warmth, moisture absorption, and softness. Under the category of fit, factors such as elasticity, freedom of motion and freedom from restriction, as well

as shrinkage are important.

In many instances, these parameters may be mutually exclusive or incompatible with other requirements—such as durability—and as a result the potentialities of developing completely functional constructions are limited.

The cushion-sole sock, developed and standardized for general Army use in 1943, represented a marked departure from the conventional construction for military socks.

The idea for the cushion-sole

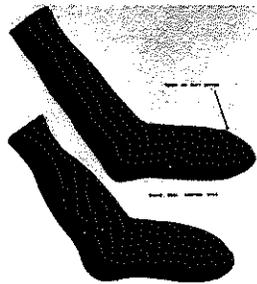


Figure 2

sock (figure 2) was conceived and recommended to the Quartermaster Corps by W. B. Davis and Sons, Fort Payne, Ala.

In extensive field tests conducted by the Quartermaster Board at Fort Lee, Virginia, the cushion-sole construction was favored unanimously over other types. Thus, it was adopted and issued to the troops in the field, where it gained widespread acceptance.

Typical of most new developments, introduction of the cushion-sole feature pointed up a serious deficiency in the wool sock—excessive shrinkage. Although the body of the sock was only 50 per cent wool, its rather loose structure and its 100 per cent wool terry sole caused it to shrink and felt considerably when subjected to the rigorous laundering procedure used in the field.

Complaints about the poor dimensional stability of the new item led the Quartermaster Corps to embark on an intensive research program to find a means of controlling wool shrinkage.

As a result of this work a new shrink-resistant treatment was

Continued on Page 39

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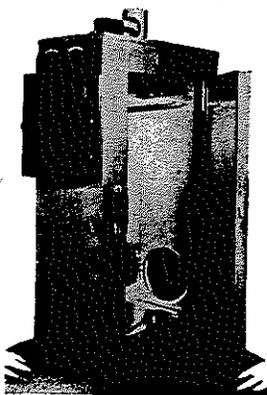
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Special QM Report On Hose Research

Continued from Page 17

developed which became a specification requirement for the cushion-sole and the ski sock. The Quartermaster Corps then continued its studies in this field until methods of treatment were found for the many other wool items procured for military use, such as mufflers, sweaters, skirts, and underwear. An interesting comparison of a shrink-resistant treated and an untreated cushion-sole sock after 20 mobile launder-

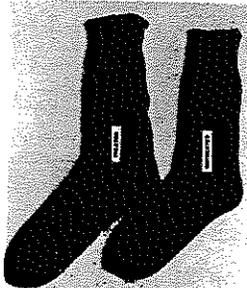


Figure 3

ings is shown in figure 3.

Unfortunately, we still have not reached our ultimate goal in controlling shrinkage of the cushion-sole sock. Other factors over which the anti-felt treatment has no control—such as tension applied in boarding—produce an additional shrinkage potential which continues to make shrinkage of wool socks a source of difficulty in the field.

Even with the application of a minimum amount of tension, a sock can be stretched from a half to a full size in the boarding operation. If it were possible to launder such socks with proper handling, such as would normally be employed in a home or in a commercial laundry, this slight stretch would present no great problem.

However, the drying system employed in field laundries utilizes the principle of tumbling, which produces shrinkage much in excess of that usually encountered elsewhere. As a result, shrinkage still remains a serious problem in the utilization of military hosiery.

Recently, a new test method has been developed which gives a more realistic indication of the amount of shrinkage sustained after successive field launderings. This new method has been adopted for practically all items treated for felt resistance, such as sweaters, shirting, and underwear.

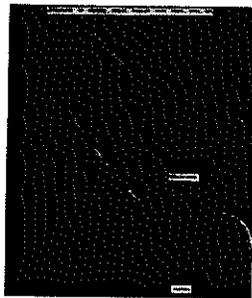


Figure 4

However, the new method has not yet been applied to the cushion-sole sock, pending the concurrence of the hosiery industry. The new test procedure indicates that the most careful control of boarding must be exercised in finishing socks to avoid excessive shrinkage in laundering. In fact, it has been found that a better method of finishing military sock-gear to reduce excessive relaxation shrinkage would eliminate the boarding operation completely.

A number of experiments have been conducted by our laboratories which indicate that if the socks are extracted and tumbler-dried after wet finishing, practically all of the relaxation shrinkage is eliminated and the socks thereafter will be completely stable when laundered in the field.

It is recognized that this procedure is rather unorthodox and might present some problems as far as sizing the sock properly. However, the advantage to be gained in functional performance would appear to offset the sizing difficulties and might warrant increasing the tolerances for foot length, leg length and other critical dimensions of the socks.

Experiments of this nature are continuing and there is a possi-

bility that this method of finishing may be adopted in the near future. A comparison of a normally boarded sock with one tumbler-dried in finishing is shown in figure 4.

The scope of our specification for anti-felt treatments for socks is being extended to allow the use of the recently-developed stock, top and yarn treatments in addition to the conventional sock treatment. These processes have advantages over the controlled chlorination treatment specified heretofore, in that better and more uniform shrinkage control can usually be obtained on the large volume top and yarn treatments.

In addition, these procedures relieve the sock manufacturer of the responsibility of carrying out the anti-felt treatment, which normally requires careful control.

Another problem confronting the military services is the shortage of looping capacity for heavy socks. The shortage of both looping equipment and trained personnel for its operation would become acute in the event of substantial procurements.

During World War II this shortage led to the acceptance of an overlack seam as a substitute for looping, but this was unsightly in appearance and, more important, caused discomfort and irritation to the wearers which produced toe blisters and sores. Recent experiments have led to the use of an F5a-1 seam (flatlock) using a 606 type stitch (figure 5) which is considered much more satisfactory for looping. This is a butted seam which is flat, smooth, durable and sufficiently elastic.

The time required to train an operator to make a flatlock seam is estimated at between three to five days, as opposed to the several-month period needed to train a looping machine operator. Present output of the available models of these machines would approxi-

mate 20 dozen pairs per machine per eight hour day—roughly half of the production of a looping machine.

However, another model of the flatlock machine specially designed for socks has been tested and production on this new model will approximate seventy-five dozen pairs per eight hour day. Effort is being made to stimulate interest in industry in the production and use of this type of equipment as a substitute for the scarce looping machines.

The flatlock seam has been authorized as an alternate construction in lieu of looping in current procurements of ski socks and could, if necessary, be specified for the cushion-sole sock.

Still another problem in connection with the use of ski socks has arisen because of their extreme bulkiness, which produces a severe bunching of fabric over the instep while the sock is being worn.

An attempt has been made to decrease the amount of fabric in that region of the sock by making a sock with foot and leg portions more nearly than usual at right angles.

Figure 6 shows an old and a

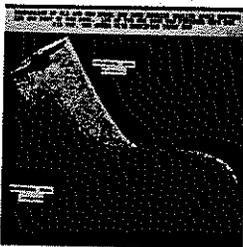


Figure 6

new model sock mounted against a pair of mutually perpendicular axes. It can be seen that the angle at the instep of the new model sock has been reduced by approximately 20°.

These socks were tested in field trials last winter and were found very satisfactory. They were comfortable, fitted well, conformed to the contour of the foot, and eliminated the excessive wrinkling at the instep and constriction at the heel. Ski sock manufacturers are being encouraged to convert existing machines to produce the right-angle construction.

Hosiery research in many other areas is being conducted by the Quartermaster Corps in cooperation with the other military services and the hosiery industry. The services are indeed fortunate to have the excellent participation and cooperation of an enlightened hosiery industry and of the National Association of Hosiery Manufacturers in their efforts.

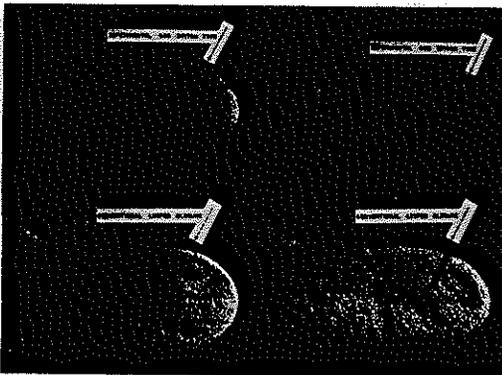


Figure 5