Army

German Textile Processing and Equipment,

THEATER SERVICE FORCES EUROPEAN THEATER APO 887 NEW ...

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TECHNICAL INTELLIGENCE REPORTS

GERMAN TEXTILE PROCESSING AND EQUIPMENT

Reported by

FRANCIS S. RICHARDSON
QMC Consultant

2 August 1945.

TECHNICAL INTELLIGENCE BRANCH

PROCUREMENT DIVISION

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Table of Contents.

Subject: German Textile Processing and Equipment.

Object: To investigate the textile dying, printing, and finishing industry and obtain information concerning methods, materials and equipment.

Plants Visited and Personnel Interviewed:

Würtembergische Cattunmanufactur in Heidenheim.

Mr. Curt Scheffler	- Director
Mr. Wilhelm Maugh	- "
Mr. Lewesch	- Colorist (Superintendent)

Neue Augsburger Kattunfabrik in Augsburg.

Mr. Fritz Piepenburg	- Director
Doc. Hans Engelmann	- Director
Mr. Franz Fohrmann	- Director

Heinrich Habig in Herdecke - Ruhr.

Dr. Habig	- Director
Mr. Leo Habig	- Director

Bleicherei Uhingen AG. in Uhingen.

Dr. Fritz Blezinger	- Director

Schlieper & Baum in Wuppertal.

Mr. Baum	- Director
Dr. Doring	- Chemist

Verseidage in Crefeld.

Mr. Klemm
Dr. Zomtogel

General: The plants visited and personnel interviewed gave a good cross section of the textile finishing industry in Germany, with the emphasis on printing

plants. The review of processes and equipment will be in the normal procedure of cloth going through a mill.

At the present time it has not been possible to visit such manufacturers of equipment, as Haubold, Zittaeu and a few others. While it is doubtful if they have produced any new equipment during the past few years they well could have had some new developments as far as the blue print stage.

Processes Prior to Dyeing:

Nothing new was noted nor new developments planned in the handling of cotton. The fabric was singed on regular gas or gas heated hot plate singers, impregnated with an enzyme and allowed to stand in bins before going to the keirs. Some of the steeping bins were lined with porcelain brick. Keirs used are standard with center pipe. Some mills still employ the double boil with goods remaining in the keir between 16 and 24 hours. Occasional use is made of the horizontal keir, due to the fact that the keir can be kept in operation continuously. The goods being loaded on trucks which are prepared or unloaded, while a set of loaded trucks are in the keir. This type boiling was only used for goods to be printed on white grounds, as it had been found that cloth boiled off in this manner was not suitable for dyeing solid shades, espacially vats. The majority of the bleaching is done with chlorine, some yarn dyed fabrics were peroxide bleached but the use of peroxide does not seem to have been large. Much of the equipment in the bleach houses is old and does not show any attempt to modernize. Only one plant was using a piler system and it was of their own construction and design. Others were storing in bins after impregnating with chemic. Some were

using sulphuric acid, others sodium bisulphite as an anti-chlor. Washers were standard type rope, either fully vertical or semi horizontal. One interesting set up had the washers set over a stream which flowed under the mill and assured an excellent wash. Mercerizing is done entirely on Heberlein & Zittau chainless machines. None of the mills visited had mercerizing frames and reportedly, mercerizing on frames has been completely abandoned in Germany. Drying was done on dry cans or dry box enclosed clip or pin frames.

Rayon has been consdered as a cotton substitute and much of the handling of it has been done with this thought in mind. Some of it was actually keir boiled and all mills give practically every yard they run a chlorine bleach. Most spuns contain starch size which requires an enzyme treatment, so all spuns are so treated. A typical rayon set up in one of the mills is herewith described. The equipment was quite new, all of wood and all of their own design and construction. In principle, the procedure was the same in other mills. Crepes (all rayon) and Bemberg triple sheers called "Lavable" are given a treatment with a weak caustic solution, about 3° be, on a drum or drums at full width and allowed to remain full width on a belt which is travelling through the caustic solution.

The cloth then is roped and fed through a series of machines ressembling small Rodney Hunt washers except that they are narrower at the bottom than at the top. They were separated into compartments and the strands passed through porcelain pot eyes rather than bars or a rake. The procedure by machine was water wash, chlorine bleach, anti chlor, water, 3 soapings, and rinse. The bleach was controlled as to active chlorine content. This range operates at a speed of about 50 meters per minute.

All crepes are embossed before boil off usually with a pattern similar to the

"Tree bark" one.

In the case of spun rayon, they are first given an enzyme on a small rope washer then piled lateraly in a U box on a moving slatted belt which gave the goods about one hour with the enzyme in it, and processed the same as the crepes.

The only reason given for bleaching was that they obtained a better white, both for a white ground in printing or when they had a white discharge effect. Examples of their work which were examined, did not bear this out. In fact the whiteness of the ground in a print received considerable attention and work to improve it was carried out by I.G. Farben. They found that white grounds could be considerably improved by applying a flourescent white material to the fabric in the finishing operation .

It appears that the idea of bleaching rayon originally arose from the fact that it was considered as a substitute for cotton and not for silk and their thinking was guided accordingly. There was no evidence that the cloth from the weavers was so dirty as to require universal bleaching. About one year before the end of the war all bleaching of rayons was stopped, by government order, in an attempt to lengthen the life of the fabrics.

No saponification of mixed viscose and acetate fabrics was encountered and all persons quired said it had been tried but was not successful. They did not think it was a good thing to do and had had so much trouble with it that they refused to handle any fabric in this manner.

Cotton Dyeing:

This is very largely vat dyeing. The I.G. Farben have done a good job of selling everyone on the desirablity of having fabrics which were "Indanthrene" dyed. There is therefore not a great

deal of yardage done with direct colors, such as direct colors padded on. The "Indigosol" dyes are extensively used for the production of light shades. Naphtols, Rapidogens, and the Fast Color Salts are much used and some Sulphur and Diazotized colors are employed.

A few military items were dyed with Sulphur colors, particularly fabrics that were used to make knapsacks.

All vat dyeing is done entirely on the jig or by the pad-jig method. No continuous methods were encountered and apparently no work has been done to develop such methods. If there has, it did not get as far as the mills doing the work.

Automatic jigs are extensively used, equipped with differential drive machanisms. They are automatic in that they reverse themselves and can be set to stop after running a given number of ends. Quite a few of them are the product of Benninger in Switzerland.

Many are equipped with a third beam roll which is suspended between the two regular ones and at a higher level. Both ends of this roll are geared into a rachet and it may be cranked into a position so that it excerts its weight on the cloth as the end is being run and the roll builds up. In this way a machanical squeezing action takes place and helps penetration of the dye liquor into the fiber. It is also helpfull when fabrics, are being run on a jig, that have selvages that tend to pile up.

Pads are old style and nothing approaching the Micro set or hydraulic controled machines has been seen. Rolls, are small and entirely hand set. The preference is to use a hard rubber bottom roll and a soft rubber top roll.

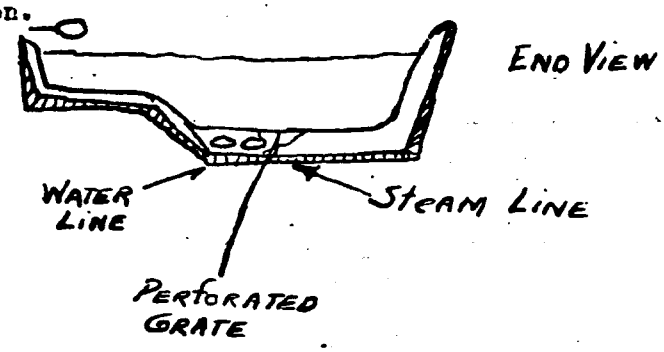
Every plant is equipped with a continuous dyeing range, used mainly for applying Indigosols. Standard machines consist of a pad, and a full width flat washing range, with rollers suspended over the first few boxes for aireating the goods.

The first two boxes in the range are made of wood, or wood, lead lined. The balance of the boxes are made of iron. The nip rolls between boxes are individually motor driven with compensator controls. New machines of this type are very well built.

Some mills have enclosed their jigs by building glass windowed cases around them. They claimed better results and more even shades were obtained than when they were operating without enclosures.

Rayon Dyeing: Much rayon is vat dyed and is done in the same manner as cotton. Rayon crepes and other fabrics are dyed in the beck or reel. Most of the dye reels are small, they do not dye over ten or twelve pieces at the most, per machine. A ten foot dye reel is the largest observed. Many are all wood but some are procelain lined jobs, including porcelain topped slats on the reels. These are unsatisfactory mainly because the porcelain becomes rough in a few years, and chafes the cloth. Some plants had a few stainless steel lined boxes, which were considered the best. No self sustained machines were seen. Enclosed types are used by some of the mills. These are of their own construction and range from elaborate affairs with glass doors to crude covers or hoods suspended over the machines.

A new form of box was developed by one printing mill, which had four of them in operation.



The box was constructed of wood with a Monel lining having a trough in the center and running the length of the box. This trough was covered with a perforated sheet of monel and contained the steam line and water line. The front section was raised up and made as shallow as possible and the pin rail was placed at the front of the box. The depth of the box, from front to back, was foreshortened by the width of the color section. Color and chemicals were placed in a large funnel connected to the steam line and steam injected. The boxes they had built contained 1200 liters as compared to 4000 liters in a conventional box of the same size and cloth capacity. The saving in steam and materials is obvious. The equipment was in operation and appeared to be very practical.

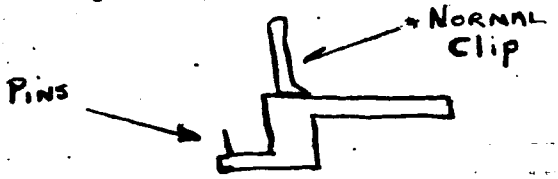
Continuous or endless dyeing in the reel had been tried by a few plants but was not considered practical and was abandoned. No dye reels were seen that had been equiped to operate in this manner. One plant had set up a continuous diazotizing and developing range for black and navy shades. They were, however, doing the dyeing in single strands in separate machines and therefore having to sew the pieces together before going through the continuous range. This plant was considered one of the most modern in Germany and the machine was considered quite a forward step in the continuous handling of cloth. This particular mill had 120 dye reels all of which were equiped with thermostats to control the temperature. They had experimented with quite a few types before finding one which was suitable.

Extraction of water from the cloth after dyeing is being done by the three conventional methods, centrifically, by squeezing, or by vacuum extractors. Some of the vacuum pumps create a vacuum hydraulicly rather than mechanically.

All dyehouses have the universal problem of ventilation. Attempts to handle it are much the same here as in the States. Either enclose the machines

and reduce the heat and moisture content of the atmosphere or exhaust the moist hot air from the room. Nothing new or unusual was observed along either line.

Drying: Cotton is either can dried or frame dried on dry box enclosed frames. Rayon is mainly dried on dry box enclosed frames. There is an important and interesting point however in regard to the frame drying of both cotton and rayons and that is that extensive use is made of the pin frame. The most modern type of long frame in this country is a combination clip and pin frame, equipped with automatic overfeeds for the pins, electrical guiders and width regulators. No weft straigtners were observed. The following sketch shows the arrangement of clip and pins



The flash plates at the entering end are used when running with the clips and are removed when using the pins. The latest piece of equipment of this type is built by Kranz of Achen.

The procedure for drying is to run cottons on the pins when shrinkage control is desired. In fact the use of pin frames for cotton has been extensively used to approach the results obtained by Sanforizing. Results are not as good as when a fabric has been properly sanforized. All rayon crepes and sheers are pin frame dried at all times, unless they are dried in loop or net driers, which are used occasionally in some plants. The use of the loop or net drier is a matter of choice of operating personnel but it is

apparently the universal opinion that final drying after finishing should be on pin frames. Spun rayon fabrics are handled in different ways depending on the ideas of those in charge. They are not dried on cans at any time nor in any mill, unless on a few booster cans in front of a long frame range.

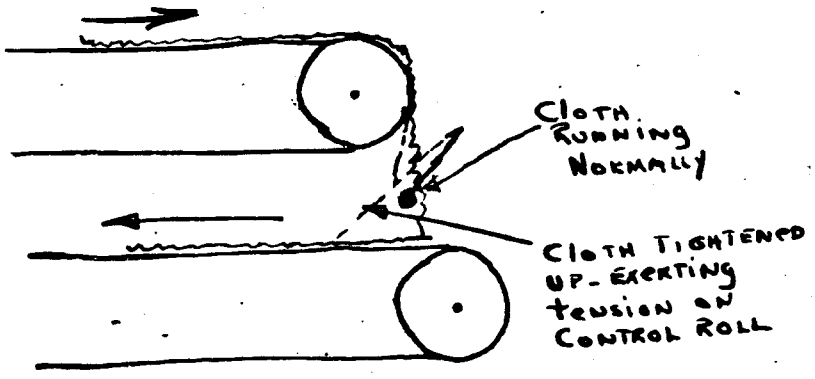
The subject of drying rayons has been given considerable attention in this country and agreement has been reached by all concerned that they must not be subjected to high temperatures. By high temperatures they mean, not exceeding 110° Centrigrade or 230° Fahrenheit. The reasoning behind this insistance on low temperature drying is that the high temperatures damage the synthetic fibers and detract from their wearability. Therefore much of their drying equipment is large, frames run 120 feet in length and are considered still too short to give operating speeds desired, and drying chambers behind print machines are all large. One mill had a dry box enclosed frame which did attain highly operating speed but the frame was 200 feet long. It is of course not the high heat in itself, which they are concerned about but rather the effect of it on bone dry goods. High temperature plus high operating speeds, which leave 6 % to 8 % of moisture in the goods meet with their approval. But they say how do you control such an operation, any slow down will overdry and damage the fiber. Also they feel it is unwise to batch up on rolls after such a drying and retain the high heat in the roll. Another argument advanced in favor of the low temperature drying, aside from the damaging factor, is that better printing surfaces of the fabrics are produced.

There is an inconsistency in their thinking and processing procedure, namely, they chlorine bleach synthetic fabrics, which at best is a tricky business as far as retaining the full strength is concerned and then keep temperatures down in drying to preserve

strength. It seems possible that heat control may have evolved as a correction for bleaching defects, at an early date when bleaching control was not fully excersised. Weakness of fabric may have been referred to fiber manufacturers and the heat angle developed. Further unquiry into this matter should be made to ascertain what facts and figures have been produced in regard to the effect of heat on the various rayons.

Loop type dryers in Germany are similar to those in the United States, in general principal and design. Some of them are so constructed that they will deliver at the entering end. Such a machine may be of some advantage where a space, or shape of building problem develops.

An excellent net drier was observed in one mill. This machine had an individual motor drive for each tier. The speed of the motors on successive nets was controled by a light roll hung between the tiers. When the cloth shrunk in drying and tightened up, it excerted a pull on the roller which automatically slowed down the motor of the next tier. Likewise if the cloth is too slack the roller will swing in the opposite direction and speed up the motor of the next tier.



Printing: The printing branch of the textile industry is a considerable one. Prints are popular within the country and a very large export trade was carried on.

Pattern design and styling show lack of originality and imagination. A monotonous similiarity is encountered throughout the industry and over a period of years in many of the patterns. Heavy coverage using small repeats with many colors has been in vogue.

Standard type print machines are used, mainly of German manufacture with a few French machines in the older plants. Print blankets are longer than those used in the states. All mills were using back greys and while some knew of blanket washers they were of the opinion they were only suitable for heavy fabrics. While painfully short of cotton and using back grey fabrics of many mixed fibers, such as rayon and "flockenbast" (Bast Fibers) there was no development of any continuous type of back grey washing arrangements. This may have been due to the fact, that textile equipment manufactures were making war equipment of one kind or another and the personnel with the "know how" were otherwise engaged. This may account for the lack of developments in textile processing equipment of any kind, within the past few years. The fact that processing equipment was of low priority, is evident and the latest delivery, encountered of a piece of equipment was 1942.

All print machines are equiped with dry boxes, none were seen with cans. The boxes were preferred regardless of whether they were running cotton or rayon. They are all very large, usually from floor to ceiling, approximately 15 feet, and 18 feet long or longer. Everyone is of exactly the same style, in that the rollers are placed in the box so that there are two lines of rolls forming a large X. This type of dryer is well known and used in the United States, but it is by no means

universal equipment as it is here.

Numerous types of engraving for print rolls are employed and are dealt with in a separate report on engraving.

In the handling of back greys at the print machine some mills batch up on rolls if the grey is to be used over again but plait down if the grey is to be washed. It is therefore possible for the grey tender to lay outbroken seams and damages and sew or remove bad sections. This saves having a man making a saparate operation of inspecting and repairing the greys prior to washing.

Most mills use an enzyeme in the back-grey washing process to be sure to remove all starches.

A description of several appliances for printing machines will be found in the patent section of this report.

Print Colors: Practically all types are used, vats being predominate. As many of their patterns are application ones, both on rayon as well as cotton, full use is made of the possible combinations of Indigosols and Rapidogens, also Fast Color Salts and Naphtols are extensively used. Some printing with selected Direct and Acid colors is done on rayon. The discharge work is of course done entirely with vats. Pigment printing was also done but lapsed due to the war, which limited the availability of the binding materials. Most of the pigment work done by I.G. Farben was with water soluble binders or water emulsions, such as urea and melamine formaldehydes and poly vinyl acetates. The application of these pigment colors involved nothing new. The preparation story of these items is being prepared by the Chemical Team.

Acetate fabrics have been printed with the usual acetate range of colors, plus a few of the basic type. They have also been printed with a new line known as "Astrazons", produced by I.G. Farben. These colors are made from the basic group but have much better light fastness and are extremely bright. They may also be applied to rayon and acetate combination fabrics.

These colors are very important from a military point of view in that the yellows and reds posess excellent fluorescent properties. The fact that they can be applied to the fabric in a water medium would greatly simplify dyeing and printing of flourescent items needed by Quartermaster, Signal Corp and Air Corp.

A list of the colors produced, application methods and fastness properties follows.

Astrazon Yellow 5 G
Astrazon Yellow 3 G
Astrozon Orange G
Astrozon Orange R
Astrazon Pink FG
Astrazon Red 6 B
Astrazon Blue B
Astrazon Blue G

These colors are extremely bright, posess good fastness to light, very good fastness to water and washing. Primarily developed as print colors they may also be dyed. They are readily soluble, fast to sublimation and of high yield.

Printing Recipes.

20 - 30 grams are dissolved with
260 -240 " water and

40 - 50	grams	Glyceine A by short boiling. This solution is stirred into
650 -650	"	Senegal or crystal gum thickening. Immediately before printing
30 - 30	"	Celloxane is added to the cold printing color
1 kilo		(This is a solution of a metal salt).

Thickening for Reductions:

700	grams	Sensgal or crystal gum thickening
250	"	Water
30	"	Glycine A
20	"	Celloxane
1 kilo		

The above paste applies to all the colors with the exception of the Astrazon Pink FG. When using this color the Celloxane must be omitted.

After printing and drying the prints are steamed for 30 - 45 minutes in a Cottage steamer without pressure and with not too moist a steam. They are then aftertreated, without previous rinsing, for about 10 minutes in a bath containing 3 - 5 grams Katanol WL per liter, rinsed well and dried.

The chemical composition and manufacturing procedure of these colors is being investigated by the Chemical Team.

Light Scale 1 to 8 Others - Scale 1 - 5

	Light	Water	Washing	Sea-Water
Astrozon Yellow 5G	Fairly good to Good 4 - 5	Very Good 5	Very Good 5	Very Good 5
Astrozon Yellow 3G	Fairly Good to Good 4 - 5	Very Good 5	Very Good 5	Very Good 5
Astrozon Orange G	Moderate to Good 4	Good to Very Good 4 - 5	Good to Very Good 4 -5	Good to Very Good 4 - 5
Astrozon Orange R	Fairly Good to Good 4 - 5	Very Good 5	Good to Very Good 4 - 5	Very Good 5
Astrozon Pink FG	Moderate to Good 4	Good to Very Good 4 - 5	Good to Very Good 4 - 5	Very Good 5
Astrozon Red 6B	Moderate to Good 4	Good 4	Good 4	Good to Very Good 4 - 5
Astrozon Blue B	Good to Very Good 5 - 6	Very Good 5	Good to Very Good 4 - 5	Good to Very Good 4 - 5
Astrozon Blue G	Good 5	Very Good 5	Good to Very Good 4 - 5	Good to Very Good 4 - 5

The water soluble celluloses have been extensively used as print gums. Their use was, one of preference in some cases, and necessity in others, as natural gums and starches were scarce.

Print formulas for vats and Indigosols using the soluble celluloses appear in the report on Camouflage Fabrics.

Ludigol is the only padding compound used either before or after printing or both. Padding is done on a print machine.

Equipment for preparing print pastes are of three varieties, the colloidal or roller mill , the French Strainer, which forces the paste through a screen by means of brushes and a vacuum strainer. This last one is used in place of both the French Strainer and straining through cloth. The equipment consists of a large funnel with a broad base containing a screen, through which the paste is drawn by means of a vacuum created in a chamber under the screen, by a vacuum pump. An improved roller mill is produced by the concern of Ernst A. Itterlein. This consists of a large, water cooled, steel drum which revolves under a flat straight bar. The chamber holding the paste is set over the drum which , revolving at high speed forces the paste between itself and the flat straight bar. The distance between this flat bar and the drum is adjustable and very fine milling is possible. The steel used for the face of the drum and the bar is of extreme hardness. To prevent the formation of lines in either bar or cylinder, the cylinder moves from side to side while running. A machine with a roller one meter long will mill between 80 and 100 kilos an hour.(Approximately 200 gal.)

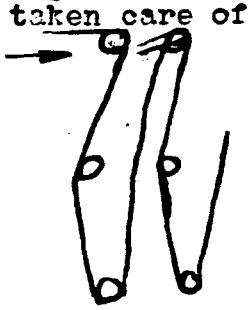
Some plants produce considerable yardage of all vat colors by combining vat and white resists under an Indigosol over pad. The pattern and the padding being applied on the print machine in one run with the padding roller last. Goods are dried, neutral aged for 5 to 7 minutes and wet developed in the continuous washer, with sulphuric acid. Only light colored grounds or paddings are done by this method, although some army camouflage fabrics of one hundred percent coverage and in strong colors were done in this manner.

Aging and Steaming:

Agers are, generally speaking, of the same type as used in the States with some exceptions. One notable one being an ager with a roller arrangement the same as is employed in the print dryers. The rollers form a large X and the cloth forms a box, progressing from the outside toward the center. The cloth enters the ager in the normal way at one end passes over the rolls to the center where it runs over a bar or roll set at a 45^{0} angle and leaves the ager through an opening in the side. This type of ager is principally used for cottons as the long stretch between rolls on the intial time around would form creases in such fabrics as crepes. The feature of the machine is, that at no time, does the face of the cloth strike a roller. The disadvantage is that, unless a large volume of cloth is ahead of the ager two men are necessary for its operation.

Another type encountered had a third set of rolls midway between top and bottom and out of line with the top and bottom rolls. This was used for crepes, the purpose being to break the long stretch between top and bottom rolls and so avoid creasing. This machine had a double drive on it, the first third of the rolls being driven by one motor, the second two thirds by another. There was a compensator between sections which controlled the speed of

the motor driving the first section. Another ager of the same type was devided into three sections having two compensators. In this way shrinkage or elongation of the fabrics are taken care of and they run smoothly.



Arrangement of rolls showing position of extra set.

Agers constructed of iron frames and stainless steel sheeting are used for acid aging. The acids used are acetic and formic in a proportion of 1 part acetic to 2 parts formic.

Various attempts to keep the temperature down by dampening the cloth have been made with atomizers and have found some use. However the best method developed for keeping a uniform condition of the steam temperature has been the use of a cooling tower. This is simply a metal tower set up along side of the ager and connected with the incoming steam line. Superheated steam of 6 atmospheres is fed into the bottom of the tower in which it is allowed to expand and is then conducted into the ager through the water in the water well in the normal way. As originally designed and constructed the tower had a water coil inside of it but experience showed this had little effect. The expansion of the steam in the uninsulated tower was sufficient to bring the temperature down to the required level. Two thermometers were attached to the tower, and were hooked up in such a manner that when the temperature of the steam dropped to 99°C a red light would light, and if it exceeded 102°C a blue one would light and if the temperature was between these limits a white light showed. Therefore the operator was always aware of the temperature of the steam entering the ager and could adjust the flow of steam

from the main line into the tower accordingly. Excellent aging conditions, were claimed, to be maintained with this arrangement. The capacity of the tower has to be calculated on the steam pressure used and the size of the ager, also the flow of steam through the ager must be taken into consideration.

A new idea for an ager and a most interesting one will be found in the patent section of this report.

Star steamers are preferred to the cottage type. While they do not hold as much, all types of colors may be steamed in them as they operate without pressure and very uniform results are obtained. As there is no pressure developed they are made of sheet metal and have a low capital cost. This type steamer has been well known and in use for many years in Europe.

Print Washing:

This particular operation is carried out mainly by conventional methods and equipment.

Vat, Indigosol, Rapidogen, Naphtol and other colors on cotton are first run on a full width washing machine, as described earlier in this report, to effect development of the colors. Subsequent soaping and washing may also be done on this range or in some form of rope washing equipment, depending on the nature of the cloth or available equipment.

Rayons are also run on this type machine for development, but some mills have shorter full width developing boxes in tandem with rope washing ranges. These rope washing set ups are as varied as the number of mills using them. Some have boxes similar to phosphate units used in the silk weighting procedure, others use a series of dye reels or slop washers with squeeze rolls.

One rope washing unit encountered was of particular interest. It was of the reel type with a large rubber covered role in front with two smaller rubber squeeze rolls pressing against it, one on either side. These two squeeze rolls were adjustable, in that the amount of pressure between them and the large roll could be set. In fact they could be set so no squeezing action was excerted, but a space left between all three rolls. This would still give mechanical action to the goods as it passed through the small space between the rolls, as shown in the sketch.

ADJUSTABLE SQUEEZE ROLLS

In most mills it is common practice to treat the printed fabrics with an enzyme at some stage in the washing operations. For instance, fabrics which have been run on the full width washing machine as the first part of the washing treatment, are impregnated with the enzyme in the last box of the machine. They are then allowed to stand for some hours or over night before further washing. In this manner all starches, used in printing, are removed.

Oddly enough many plants were using water soluble celluloses for <u>all</u> their print pastes and had not altered their washing methods. When this was pointed out, there wes no reasonable explanation offered, but it was the concensous of opinion that it was still good practice to continue to use the enzymes. Some time they would have starches again and it would be necessary step in washing.

Opening devices for goods in the rope form are the same as used in the States, scutchers, Mount Hope types or by hand.

Finishing:

The drying operations and equipment ... especially frames, have already been discussed. Drying after finishing presents much the same picture. Some finishing of rayons is done on the quetch, dry box but most of it is done on the quetch, pin frame. A few cloth wrapped quetches were noted but the great majority of them were equipped with rubber rolls.

Cottons are finished almost entirely on the pad, frame range. No separate starch mangles with subsequent framing, swing or straight, were noted. The plants inspected did not, however, do much of the type of finishing that might require such a procedure. Cotton calander equipment was entirely conventional, with the usual differences in construction detail and form. Plain, rolling, chase and Schreiner calanders, with a few moiré ones are used.

Many cotton fabrics are napped, in fact, a very considerable yardage is run in this manner. Some types of cottons that are not napped in the States, are here, and most mills have napping equipment.

The finishing equipment for rayons after framing is noticeably limited as many fabrics leave the frames as finished. The usual equipment is employed, the silk calander, decatizer and palmer. The palmer has a limited use.

Finishing agents employed consist of catine active materials, some gums, resin finishes and water repellent finishes. The water repellent finishes are probably the largest single items used in the finishing field. Strangely enough while some excellent research and development work has been done in the resin field, by I.G., these products have not been extensively used by the finishers.

On the whole the entire industry does not produce finishes which show a great deal of imagination. There is a decided lack of awareness as to what can be done to cloth, in finishing, as to variations in hand and appearance.

The water repellent finishes of I.G. called Persistols will be investigated by the Chemical team and reported by them. The various resin finishing materials marketed under the trade name Kaurits will be covered in like manner.

Inspection and put up in the mills visited, showed nothing of exceptional or unusual interest.

Recommendations:

It is recommended that the use of Astrazons for military fabrics be immediately investigated. Samples for laboratory work are being forwarded.

Future investigators should make every effort to visit the machine manufacturers in the Chemnitz area, also other machine builders should be covered and details of all types of equipment obtained. In this regard a complete investigation of pin frames and combination pin and clip frames as built by Kranz of Aachen would be well worth while. The use of pin frames for finishing in the United States should be considered.

The effect of heat on synthetic fibers has been given considerable attention in Germany and technical information from fiber manufacturers and schools or institutes, should be obtained.

Patents:

The following patents are presented in that they contain mechanical ideas of particular interest.

Reichspatent
No. 728729
Class 8a Group 9 70
H 164050 VII/8a
December 2, 1942.
To Heinrich Habig A.G. at Herdecke, Ruhr.

The famous full width washing machine consists of several compartments or reservoirs of wood, iron, etc., arranged in tandem. The cloth is run through the boxes with squeeze rolls between each unit. Because of lack of space between units it is impossible to install expanders to keep the cloth smooth and free of wrinkles.

Another disadvantage to the usual type of washing machine is, that, while the squeeze rolls take out of the cloth a large amount of the liquid from the preceeding bath, whatever is left in the cloth is carried over to the succeeding bath.

This invention provides that a space of 2 meters be left between the compartments or boxes. An overhead expander is installed so that the goods leaving the squeeze rolls pass immediately over this expander. Following the expander is a series of spray pipes, under which the cloth passes and receives a thorough rinsing before entering the next compartment. A tray is provided beneath the spray pipes to catch the wash water, also necessary carrying rolls are installed.

This extra rinsing completely frees the cloth of any carry over from the preceeding bath and thus there is no contamination from one bath to the next.

The accompanying drawing illustrates this device.

The cloth 2, is passed through the compartment 1, then over the expanders, 3 and 5, and under the spray pipes, 4.

The extra space required for the lengthier machine is offset by the improved wash.

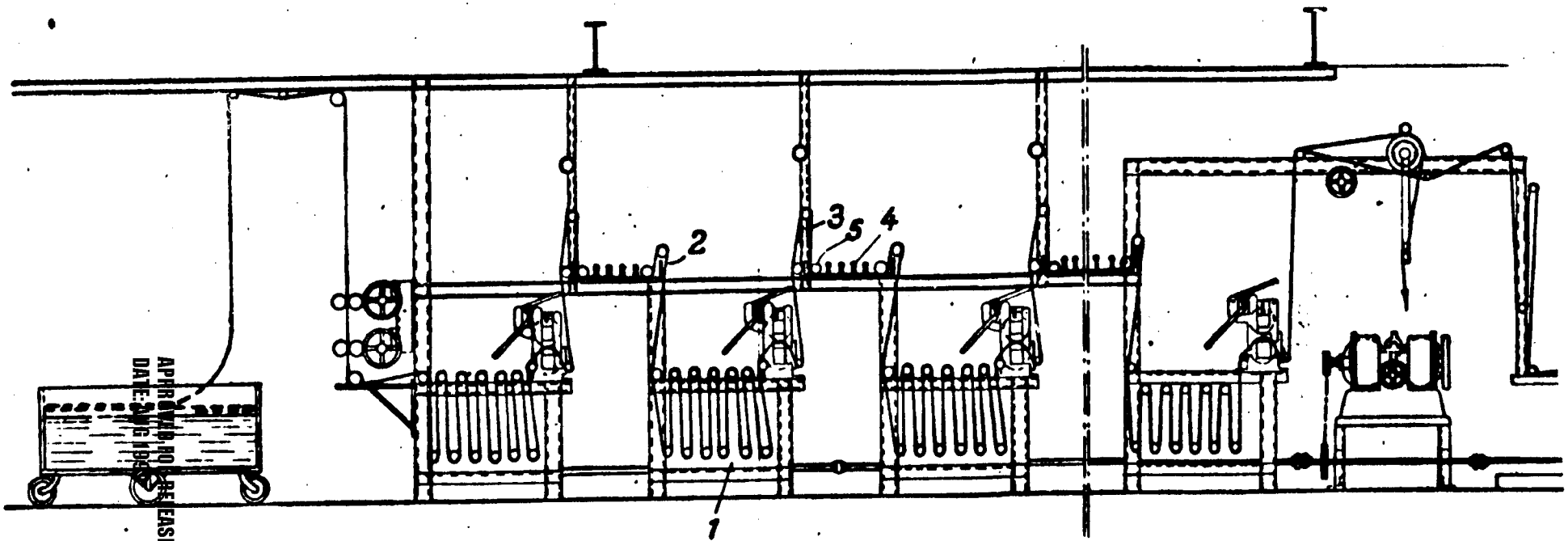
It is therefore shown that by this simple addition to a full width washing machine better washings are possible.

Comment:

It is apparent that this machine was particularly effective in developing "Indigosol" dyed fabrics by the nitrite process, as it is desirable to remove the sulphuric acid, which was applied in the first box, from the cloth, as quickly as possible and a build up of acid from the first box into the second is to be avoided.

In other processing it is possible that the arrangement might be unsatisfactory due to objectionable dilutions of succeeding boxes.

Zu der Patentschrift 728729
Kl. 8a Gr. 970



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Reichspatent No. 693 345
Class 8c Group 11 01
H 152743 VII /8c

To Gustav Mark in Herdecke, Ruhr.

This invention concerns a type of mandrel bearing for textile print machine rollers. The brass bearing now in use has many disadvantages. Due to the pressure necessary the bearings heat up, this may cause them to expand and the shaft will loosen up, thereby requiring constant resetting by the operator. Too much pressure often breaks the mandrel shafts. The great amount of pressure excerted on the print rolls requires considerable horse power to operate the machine.

This invention makes use of roller bearings in a new type bearing or housing.

The following diagram illustrate the appliance.

Fig.1. Cross Section of a cylinder printing machine.

Fig.2. Longitudinal section of the bearing.

Fig.3. Cross section of the bearing.

The print machine consists of a large cylinder 1, over which the print blanket, back grey and printed cloth are carried. The print rolls 2, are distributed around the circumference of the cylinder. These rolls are removable and have removable bearing blocks 3, at each end. The pressure on the rolls is excerted through hand screws 4, and by the counter weights 5, through levers 6. Furnisher rolls 7, supply color from color boxes 8, to the print rolls 2.

The peg ends 10 of the mandrel 9 run on the roller bearings 11 which are held in a casing. This casing can revolve and turns against the ball bearings 12. The ball bearings also turn against the ring 13.

The roller bearings revolve against the sliding piece 14 which is tappered towards the ends 16. The peg 19 in the bearing head can be moved by means of the shaft 21. Through the shape of the peg 19 it is possible to move the sliding piece 14 in two directions.

This arrangement provides easy running of the rolls, the abrasion of the ring against the bearing is eliminated by the ball bearing ring, the roller bearing adjusts itself automatically, friction heat is eliminated and considerably less power is needed to operate the print machine.

German Patent No.7774

To Franz Nesletberger.

Heat Treatment of textile material.

The heat treatment of textile material for carrying out chemical reactions on the fiber at raised temperature is effected either by the action of dry heat, for instance, by contact with heated metal surfaces (drying cylinders), by the action of radiating heat (heating plates), by the action of heated air or heated gases (drying devices, condensing devices used in the process of crease-proofing) or by treatment with water vapor of different degrees of temperature and saturation (rapid ager, cottage steamer). A special procedure is the treatment of dyed textile material with hot oil which, however, has found no practical application.

It has been found that for carrying out chemical reactions on the fiber, textile material may be subjected to a heat treatment by passing it through molten metal. The process may be carried out in such a manner that the textile web is caused to travel, by means of guide rollers, through a bath of molten metal contained in a trough. By suitably selecting the metal or the metal alloy, the temperature of treatment may be regulated up to 100°C and below. Besides by the change of the temperature, the degree of the reaction may be influenced by a variation of the time during which the textile material is in touch with the liquid metal. The liquid metal has the advantage of not adhering to the surface of the tissue.

According to the desired higher or lower temperature or the required resistance against chemical influences there are preferably used alloys (lead-bismuth-cadmium, lead-bismuth-tin, lead-tin) or pure metals (lead, tin). The metal bath may be heated either directly by firing or, more advantageously, by

electric current. In the latter case, heating elements may be used or the metal bath, contained in a non-conducting vessel, is itself used as resistance in a circuit of respective voltage whereby utilisation without loss of electric energy is guaranteed and, at the same time, it is possible to regulate the temperature in the simplest manner.

The heat treatment in the metal bath may be effected with moist as well as with dry goods. By suitable selecting the time of reaction the moist goods leave the bath in the dry state. The water evaporates. The advantage involved in the heat treatment in a metal bath lies in its being very economic. The heating of large quantities of air, as in the case of hot-air treatment, is dispensed with. The large heated surfaces of heating plates or drying cylinders cause heavy losses of heat by radiation. The metal bath requires only a small space and may easily be insolated so that losses caused by radiation are avoided to a large extent. Furthermore, a local overheating of the textile material is not possible since the liquid metal, a good conductor of heat, does not allow an accumulation of heat. To maintain a constant temperature is, not difficult especially in case of electric heating.

The treatment in the metal bath, if it is only short duration, may be performed at a relatively high temperature without the material being detoriated. In this case, the air contained in the fabric obviously acts as the insolator. On the other hand, the bad thermal conductivity of the textile fibers has a protective effect. Moreover, on account of the low specific heat of the textile fibers the consumption of heat is small, since only a little heat is carried away

by the fabric and other carriers which would also have to be heated, such as air or metal plates, are not present. The metal bath requires also very little space as compared with, for instance, drying plates.

By suitable selecting the temperature of the metal bath and the duration of the reaction (speed of passage of the goods) the effect of the treatment can be greatly used. By a very short action of the highly heated metal bath the reaction can be started in a shock-like manner, in which case the end of the reaction takes place during the travel of the goods through a closed chamber which prevents a sudden cooling. On the other hand, the reaction may also be carried out so that its course is interrupted at a certain stage by suddenly cooling the goods after they have left the bath, for instance, by blowing cold air on them.

The metal bath forms an oxide-film on its surface. In order to avoid its destruction and to thus reduce the loss by burning due to the formation of oxides which naturally can be regenerated, the goods are introduced through tubes which have a slot-like cross-section and which end below the surface of the bath. Thereby, a very small strip of the surface of the bath is agitated by the goods. A further possibility to reduce the loss by burning consists in shutting off the atmosphere by covering the bath with a device which carries the above mentioned slot-like tubings for introducing the goods and by filling the space between the surface of the bath and the cover with an inert gas, for instance, carbonic acid or nitrogen. The use of the cover is also advantageous for preventing losses caused by radiation. In order to be able to introduce the material, when starting, and to protect it, when stopping,

against the noxious influence of a too long contact with the hot metal bath, the guide rollers are mounted in pivots. But it is also possible to use a stationary system of guide rollers and arrange the trough containing the metal bath so that it may be lowered.

The new process of treating textile fabrics in liquid metal may serve as a heat-after treatment in processes for enhancing the wearing strength and other properties (by means of dimethylolurea or formaldehyde), in the process for rendering the material crease-proof or waterproof, or in processes for developing or fixing prints and dyeings obtained, for instance, by means of vat dyestuffs or coupling dyestuffs.

Examples:

1. A fabric of bleached cotton is printed with the following printing paste:

100 grams		of a 20 % paste of the dyestuff No.1349 (Schultz, Farbstofftabellen, 7th ed.)
290	"	of water
80	"	of glycerol
350	"	of starch-tragacant-thickening
100	"	of caustic soda solution (38^{0}Bé)
80	"	of sodium hydrosulfite
1000 grams		

Directly after printing, the moist goods are passed through a bath of liquid metal having the following composition:

500 grams		of lead
300	"	of tin
200	"	of cadmium
1000 grams		

The temperature of the metal bath is maintained at 125^{0}C. The duration of the passage amounts to about 8 - 10 seconds. Subsequently, the goods are rinsed and soaped at the boil. A vivid

orange print is obtained.

2. A fabric of bleached cotton is printed with the following printing paste:

60	grams	of the sodium salt of the tetra-sulfuric acid ester of leuco-3.3'-dichloro-N-dihydro-1.3.2',1'-anthraquinoneazine
50	"	of thiodiglycol
300	"	of water
500	"	of starch-tragacanth-thickening
40	"	of a 50 % aqueous solution of ammonium rhodanide
30	"	of sodium chlorate solution (30 %)
10	"	of a 1 % solution of ammonium vanadate
10	"	of ammonia solution (25 %)
1000	grams	

Directly after printing, the moist goods are passed for 6 seconds at 145°C through the metal bath indicated in Example 1. Subsequently, the goods are rinsed and soaped at the boil. A vivid and fast blue print is obtained.

3. A cotton fabric is printed with the following printing paste:

100	grams	of a 20 % paste of dyestuff No. 1220 (Schultz 1.c.)
300	"	of water
600	"	of carob seed meal thickening (20 : 1000)
1000	grams	

After drying, the fabric is padded on the padder with the following solution:

50	grams	of caustic soda solution (38 °Bé)
60	"	of sodium hydrosulfite
100	"	of anhydrous Glauber salt

After squeezing (100 % absorption of liquid), the moist goods are passed for 10 seconds at 130°C through a metal bath of the composition indicated in Example 1, subsequently rinsed thoroughly, oxydised with very diluted hydrogene peroxide solution and

soaped at the boil. A vivid and fast blue print is obtained.

4. A fabric of viscose artificial silk is printed with the following printing paste:

40	grams	of a mixture of 1-(2',3'-hydroxynaphthoylamino)-naphthalene and the diazoamino compound of diazotized 1-amino-4-benzoylamino-2:5:-diethoxybenzene and sarcosine
50	"	of glycol mono-ethylether
120	"	of diethylaminoethanol
190	"	of water
600	"	of neutral starch-tragacanth thickening
1000	grams	

Directly after printing the moist goods are passed through a metal bath which has the composition indicated in Example 1 and which has been heated to 120°C. The time of passage amounts to 10 seconds. The material is then rinsed and soaped at the boil. A full navy blue print, fast to washing, is obtained.

5. A fabric of viscose rayon staple fiber is padded with the following solution:

8	grams	of the substantive dyestuff No. 412 (Schultz l.c.) are dissolved in
892	"	of water
50	"	of glycerol and
50	"	of Glauber salt are added
1000	grams	

After squeezing, the fabric is passed for 40 seconds at 105°C through the following metal bath heated to 105°C :

300	grams	of bismuth
500	"	of tin
300	"	of lead

rinsed subsequently and dried. A fast brown dyeing is obtained.

Zu der Patentschrift **693 345**
Kl. 8c Gr. 11.01

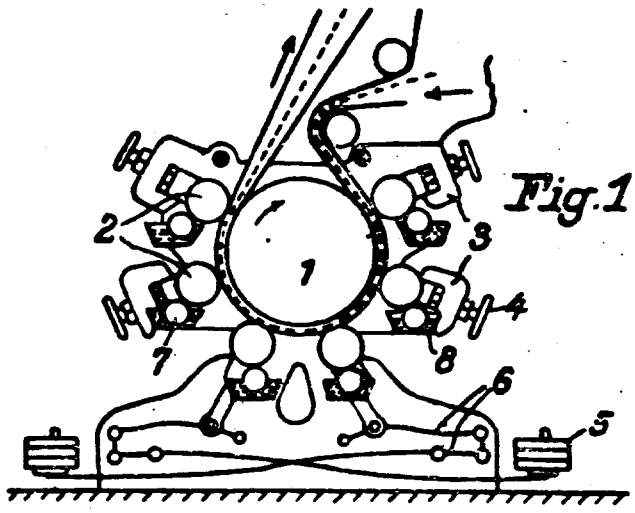
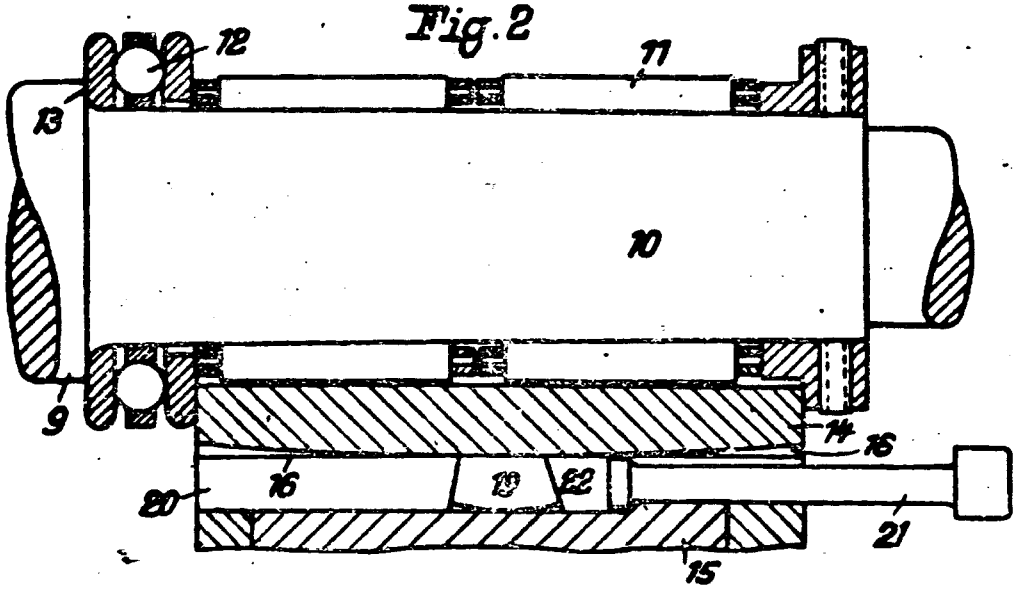


Fig. 1

Fig. 2



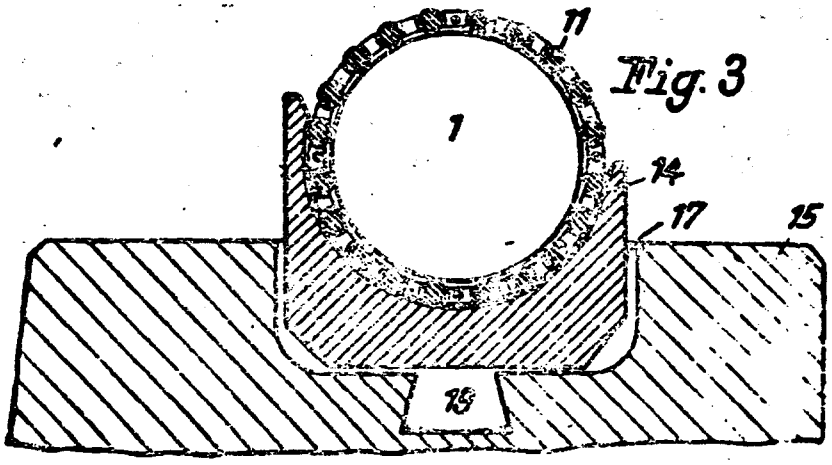


Fig. 3

6. A viscose rayon staple fabric is padded with the following solution:

200	grams	of dimethylol urea
785	"	of water
15	"	of ammonium nitrate.
1000	grams	

The material is then squeezed, dried and passed through a metal bath heated to 160°C and having the composition indicated in Example 1. The time of passage amounts to 20 seconds. The goods are resistant to creasing.

7. A fabric of bleached cotton is printed with the following printing paste:

100	grams	of a 50 % solution in butanol of a water-soluble precondensate of urea, formaldehyde and butanol are mixed with
150	"	of a 50 % solution of a modified glyptal resin (from linoleic fatty acid, phtalic acid and glycerol) in xylene and
200	"	xylene
450	grams	

Into this mixture there are introduced, while stirring with a rapid stirrer,

100	grams	of a 20 % paste of the blue dyestuff obtainable according to Example 2 of British patent 453 767, diluted with
30	"	of ammonia solution (25 %) and
420	"	of water

so that a uniform emulsion is obtained.

The printed goods are dried and, for 30 seconds, passed through a metal bath having the composition indicated in Example 1 and heated to 150° whereby the blue print is fixed so as to be fast to washing without further treatment.

8. A fabric of Viscose rayon staple is impregnated with the following liquor:

25 parts by weight of n-octadecyl-N.N'-ethylene urea
1 part by weight of fatty alcohol sulfonate
974 parts by weight of water
1000 parts by weight.

After squeezing, the fabric is passed through the bath mentioned in Example 1 at 140°C with such a speed that it leaves the bath in a perfectly dry state. The time of passage amounts to about 12 seconds. After this treatment the fabric is water-repellant, i.e. water dropped thereon runs off without wetting the fabric.

Claim:

A Process for carrying out chemical reactions on textile material at raised temperature, characterized in that compounds capable of reacting are applied on the textile material which is subsequently passed through molten metal

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