

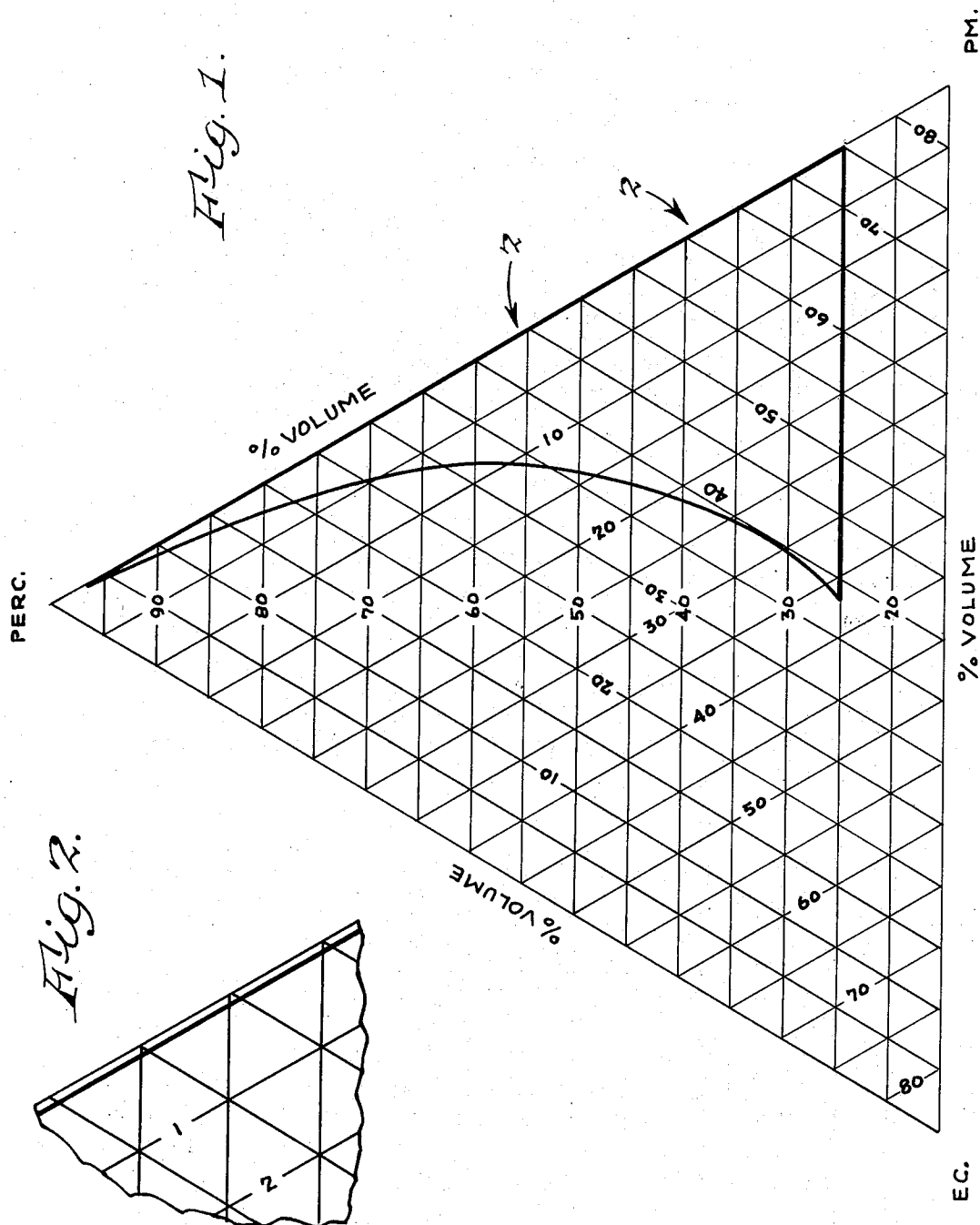
Jan. 29, 1974

F. L. SIEVENPIPER ET AL
SOLVENT COMPOSITIONS FOR SOLVENT DYEING AND DYESTUFF
SOLUTIONS PREPARED THEREFROM

3,788,811

Filed May 18, 1971

4 Sheets-Sheet 1



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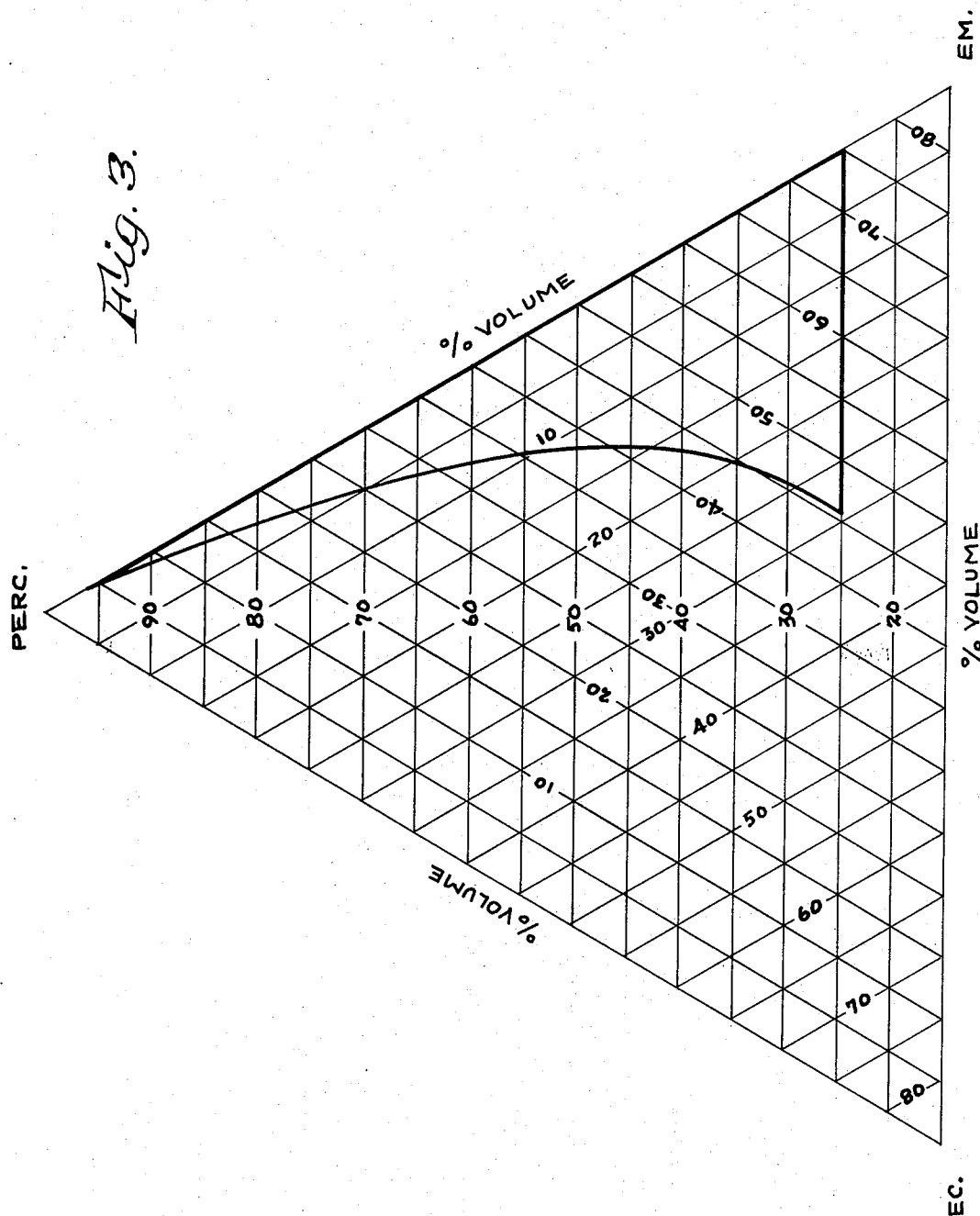
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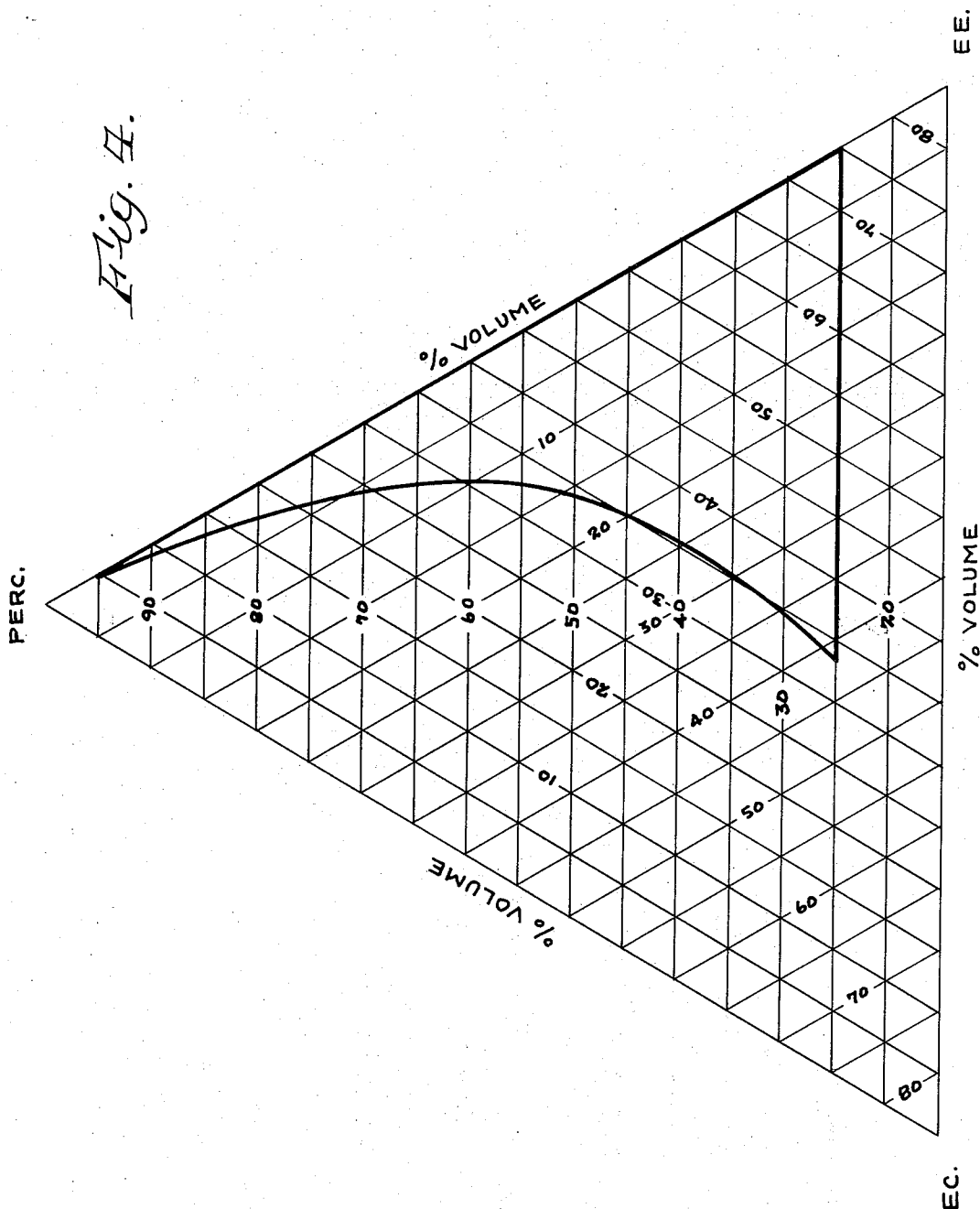
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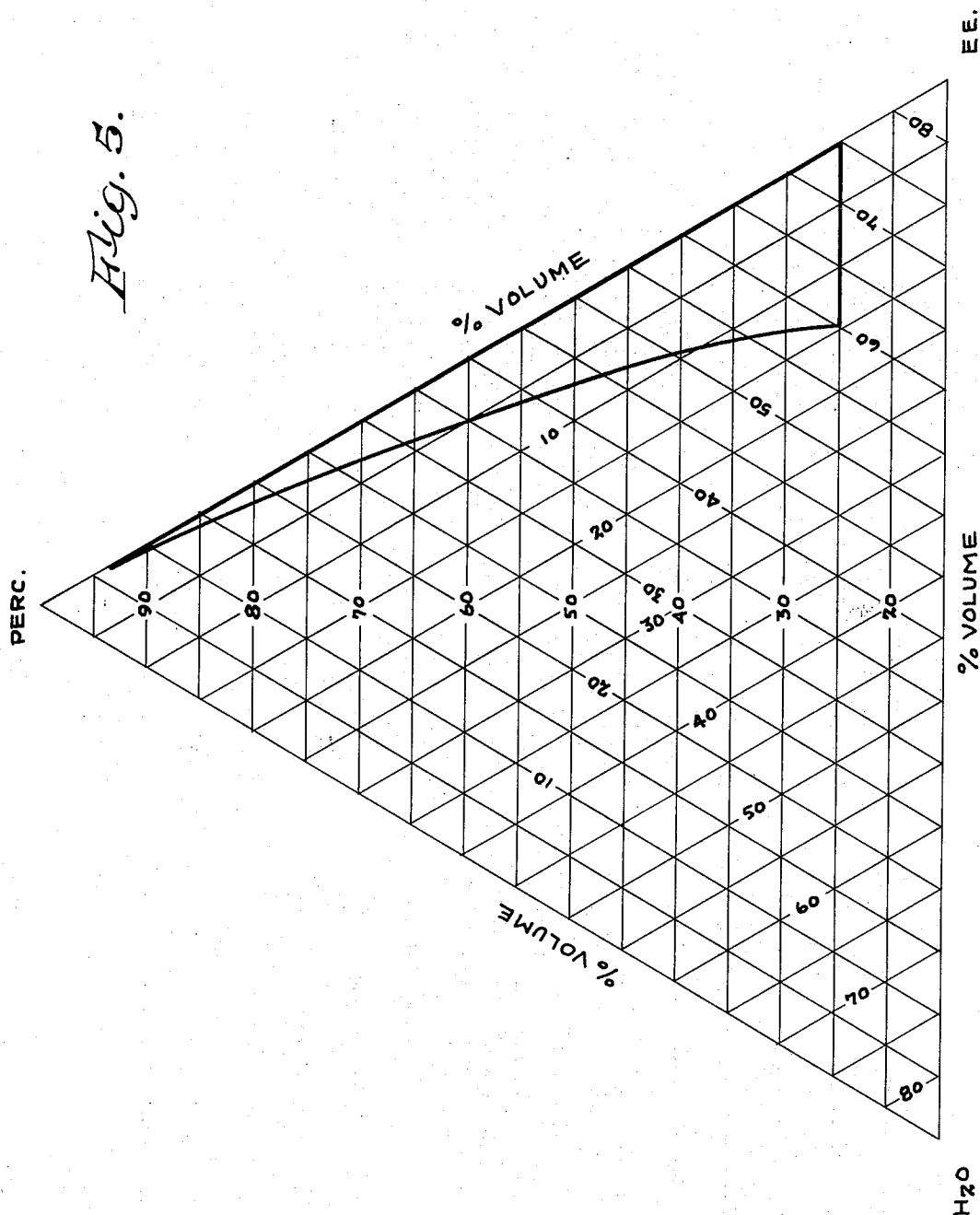
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3,788,811

SOLVENT COMPOSITIONS FOR SOLVENT DYEING AND DYESTUFF SOLUTIONS PREPARED THEREFROM

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Int. Cl. D06p 1/68

U.S. Cl. 8—175

36 Claims

ABSTRACT OF THE DISCLOSURE

Certain mixtures of halogenated hydrocarbons, polar liquids which are swelling agents for a textile fiber and which are substantially insoluble in the halogenated hydrocarbons, and organic liquids which are soluble in both the halogenated hydrocarbons and the polar solvent, form clear, stable, homogeneous compositions which are useful as solvents for diverse types of dyestuffs. Solutions of dyestuffs in these solvent compositions may be used to produce excellent dyeings on man-made and natural fibers.

BACKGROUND OF THE INVENTION

The dyeing of textile materials from aqueous solutions presents difficulties arising from the rate of diffusion and affinity between the dyestuff and the fiber. Moreover, the disposal of the spent dye bath liquors containing residual dyestuffs, acids, alkalis and dyeing adjuvants into lakes, rivers and streams presents pollution problems.

It has been proposed to accomplish the dyeing of textiles, especially synthetics, in the presence of a variety of organic solvents as the dyestuff vehicle in an effort to shorten the dyeing time and also to avoid the pollution problems associated with aqueous dyebaths. Previously proposed organic solvents for the replacement of water as the dyeing vehicle have suffered from one or more disadvantages such as undesirably low dye solubility in the solvents, hazardous to use, and others.

Attempts to improve the proposed organic solvents for solvent dyeing procedures by using dyeing assistants, co-solvents, swelling agents and the like, have given unsatisfactory results such as by altering the properties of the fibers, by degrading the fastness of the dyes, or by causing precipitation of the dyestuff from solution and phase separation of the dyeing medium. This results in spottiness and tailing in the dyeings.

It is, therefore, a principal object of this invention to provide improved organic solvent compositions suitable for use as vehicles in the solvent dyeing of textile materials.

A specific object of the invention is to provide clear, stable, homogeneous solvent compositions which are non-flammable under conditions generally employed in dyeing procedures, and which do not result in precipitation of the dyestuff from solution or phase separation of the dyeing medium.

Another object of the invention is to provide dyestuff solutions in organic solvents suitable for the solvent dyeing of textiles.

Other objects of the invention will be obvious from the following description.

SUMMARY OF THE INVENTION

We have made the discovery that certain mixtures of

(A) a stable halogenated hydrocarbon boiling within the range of about 40° to about 180° C.,

(B) a polar liquid which is a swelling agent for a textile fiber, and which is substantially insoluble in the halogenated hydrocarbon, and

2

(C) an organic liquid boiling within the range of about 75° to about 180° C. which is soluble in each of the halogenated hydrocarbon and the polar liquid to the extent of at least about 5% by weight,

form clear, stable, homogeneous compositions in which many organic dyestuffs are soluble. The novel compositions are stable, that is to say, they do not become cloudy or phase separate on standing. Solvent compositions within the scope of the invention in which an organic dyestuff is dissolved, provide excellent dyeings by a solvent dyeing procedure on a variety of textile fibers, both natural and man-made, which dyeings are free from spottiness and are of excellent fastness to washing, rubbing and the like.

DESCRIPTION OF THE DRAWINGS

FIGS. 1, 3, 4 and 5 of the drawings illustrate preferred embodiments of the invention and show those proportions of the indicated components which form clear, stable, homogeneous compositions which are also non-flammable under the conditions present in most dyeing procedures. The figures are ternary diagrams in which the proportions of the compositions are defined by the areas within the closed curves shown by the heavy black lines. The composition of a point within such areas may be read along the axis indicated in volume percent.

The curves in the drawings were determined by mixing varying volumes of two of the components (with and without added surfactant) and, thereafter determining the volume of the third component required to obtain a clear, stable solution.

In all of FIGS. 1, 3, 4 and 5, the right hand portion of the curve, which is a straight line having a vertical displacement on the diagrams, is actually .1% removed from the 0% axis of the diagrams. This could not be conveniently shown on FIGS. 1, 3, 4 and 5, but is shown in FIG. 2, and applies to all of FIGS. 1, 3, 4 and 5.

FIG. 1 shows a preferred embodiment in which PERC. is perchloroethylene, EC. is ethylene carbonate and PM is 1-methoxy-2-hydroxypropane.

FIG. 3 shows a preferred embodiment in which PERC. is perchloroethylene, EC. is ethylene carbonate and EM. is methoxyethanol.

FIG. 4 shows a preferred embodiment in which PERC. is perchloroethylene, EC. is ethylene carbonate and EE. is ethoxyethanol.

FIG. 5 shows a preferred embodiment in which PERC. is perchloroethylene, H₂O is water and EE. is ethoxyethanol.

DETAILED DESCRIPTION

When the term "solutions" is referred to herein, this is intended to cover dispersions in which the dyestuff is partially solubilized in the solvent. Similarly, the term "dissolve" is intended to refer to the state of solubilizing in which the final result will be a partially solubilized dye mixture, or a dye dispersion.

The novel solvent compositions of the invention should be formulated so as to boil over a range of between about 50° C. and the softening point of the particular textile material being dyed, usually below about 180° C. for man-made textiles. Preferably, the novel compositions boil within the range of about 85° to about 165° C. and, still preferably, between about 110°-160° C.

In practice, the volume ratio of the halogenated hydrocarbon component to the organic liquid component would be chosen to give the desired properties of dye solubility and non-flammability in the particular application involved. Then the polar liquid (swelling agent) is added. If the solution becomes cloudy, additional quantities of the other two components may be added until a clear solution results. Generally, it is desired to maximize the concentration of the halogenated

hydrocarbon and minimize the concentration of the organic liquid, while giving a stable, clear solution with the desired quantity of polar liquid (swelling agent).

The halogenated hydrocarbon component of the novel compositions generally constitutes between about 25 and 94% by volume of the composition. Use of at least 25% by volume of the halogenated component will generally ensure that the resulting mixtures will be non-flammable under conditions normally encountered in most dyeing procedures. In a particular dyeing application, however, it may be necessary to increase the proportion of the halogenated component to ensure non-flammability. Preferably, this component is present in an amount between about 50 and 85% by volume and, still preferably, between about 70 and 85% by volume. This component, which serves principally as the vehicle for the dyestuff, may be aliphatic or aromatic, and generally boils between about 40° and about 180° C. There is no minimum or maximum carbon content for this component subject, of course, to the requirement that this material boil between about 40° to about 180° C. The halogens may be selected from fluorine, chlorine, bromine and iodine, subject to the requirement that the compound is stable. This requirement will exclude a number of brominated and iodinated hydrocarbons. Typical suitable halogenated hydrocarbons include the following:

carbon tetrachloride
chloroform
methylene chloride
1-chlorobutane
trichloroethylene
trichloroethane
tetrachloroethane
chlorobenzene
o-dichlorobenzene
cyclohexyl chloride
perchloroethylene
1,1,2,2-tetrachloro-1,2-difluoroethane
1,1,2,2-tetrachloro-2,2-difluoroethane
1,1,2-trichloro-1,2,2-trifluoroethane
1,1,1,2-tetrachloro-2,3,3,3-tetrafluoropropane
1,3-bis(trifluoromethyl)benzene)

Mixtures of the above may also be employed. The preferred halogenated hydrocarbons are methylene chloride, 1,1,1 - trichloroethane and perchloroethylene, with the latter being the most preferred material.

The polar liquid component must be a swelling agent for a textile fiber and must be substantially insoluble in the halogenated hydrocarbon component. By "swelling agent," it is intended to include a substance which acts on a natural or synthetic textile fiber to accelerate diffusion therein of a dyestuff substantive thereto. As is well understood in the art, this does not necessarily mean that the "swelling agent" increases either a cross-sectional or longitudinal dimension of the fiber. In the case of natural fibers, it most frequently does however, in the case of synthetic fibers, no noticeable "swelling" of the fibers may take place. The test for the purpose herein, as described above, is whether the agent in question accelerates diffusion of the dyestuff into the fiber. By "substantially insoluble," it is intended to mean less than about .1% by weight soluble. The polar liquid is generally present in an amount within the range of about .1 to about 5% by volume of the total composition. Desirably, this component has a boiling point over 80° C. and preferably over 100° C. The upper boiling point limit is not significant. Preferably, this component is present in an amount within the range of about .2 to about 5% by volume and, most preferably, in an amount between about 3 and 5% by volume.

It will be apparent to those skilled in this art that polar liquids are quite selective in their swelling action on various types of textile fibers. Thus, water which func-

tions as a swelling agent on natural fibers such as cotton, is ineffective as a swelling agent on man-made fibers such as polyesters or polyamides. Ethylene carbonate, on the other hand, which is effective as a swelling agent for many man-made fibers, such as acrylics, is not an effective swelling agent for natural fibers. The choice of the swelling agent will accordingly depend upon the textile material which is to be dyed. Suitable swelling agents may be aliphatic or aromatic in nature. We know of no carbon content limitations for the same. Typical examples of known swelling agents which are candidates for use in the appropriate system include the following:

water	biphenyl
dioxane	dimethyl phthalate
ethylene carbonate	diethyl phthalate
propylene carbonate	thiodiethanol
o-phenylphenol	dimethyl sulfoxide

Mixtures of these and other polar liquids are contemplated also, especially in compositions intended for the dyeing of textile fiber blends, such as polyester-cotton blends.

The third component of the novel compositions is an organic liquid, boiling within the range of about 75° to about 180° C., and which is soluble in each of the halogenated hydrocarbon and the polar liquid to the extent of at least about 5% by weight. This liquid is preferably selected from the group consisting of alcohols, ethers and ketones. The organic liquid may be aliphatic or aromatic in nature and may include polyfunctional materials such as diketones, polyethers and polyhydroxy compounds. We know of no limitations on the carbon content for these liquids, subject, of course, to the boiling range requirements recited herein. These organic liquids are generally present in the composition in amounts within the range of about 5 to 75% by volume, preferably from about 7 to 40% by volume and, most preferably, from about 10 to 35% by volume. The following are typical examples of this third component of the novel solvent mixtures:

Alcohols:

butyl alcohol
amyl alcohol
hexanol
cyclohexanol
furfuryl alcohol

Ethers:

alkoxyalkanols having from 2-4 carbon atoms in each of the ethoxy and ethanol moieties, such as:
ethoxyethanol
propoxyethanol
ethoxy-2-propanol
butoxy-2-propanol
1-methoxy-2-hydroxypropane
cyclopentylmethyl ether
cyclohexylethyl ether
phenylethyl ether

Ketones:

methylethyl ketone
diethyl ketone
cyclopentanone
cyclohexanone
2-methyl-cyclohexanone
n-butyl, n-propyl ketone

Mixtures of the above illustrated organic liquids may also be employed.

Surfactants of the anionic or non-ionic classes, may be incorporated, if desired, into the solvent mixtures of this invention. When present, the overall dyeing performance of the mixtures may be improved. The surfactant, if present, is preferably used in amounts within the range of from 0.05 to 3% by weight of the solvent mixture and, still preferably, within the range of about 1 to 2% by weight. Larger concentrations may be employed, if de-

sired. Typical surfactants suitable for use in this instance include the following:

Anionic surfactants:

- sodium alkylaryl sulfonates
- alkali metal and ammonium salts of long chain alkyl sulfonates
- sulfated fatty esters
- dioctyl esters of sodium sulfosuccinic acid

Nonionic surfactants:

- alkyl phenoxy (polyethyleneoxy) ethanol
- ethoxylated castor oil
- coconut monoethanol amide ethoxylate
- tall oil ethoxylate

Other additives may be incorporated into the solvent compositions and dyestuff compositions of the invention without adversely affecting or untowardly affecting the excellent dyeing characteristics obtained in the finished product.

The solvent mixtures of the invention provide excellent dyeing vehicles for the solvent soluble forms of organic dyestuffs. The resulting dyestuff containing compositions are suitable for dyeing synthetic and natural fibers. The solvent mixtures are non-flammable, have high flash points, and are readily volatilized for recovery and re-use. Because of the clear, stable, homogeneous character of the solvent mixtures of this invention, the dye solutions are evenly distributed on textile materials and thus provide spot-free dyeings thereon.

The organic dyestuff is used in a solvent soluble form. By "solvent soluble form" is meant a form in which the dyestuff is substantially free of the usual inorganic salts present as strength reducing agents, dispersants, and the like. Many dyestuffs of the acid, direct, and basic classes are usually marketed as mixtures with inorganic salts such as sodium sulfate and sodium chloride, which are added to reduce the coal tar dyestuff content. Such inorganic salts are generally insoluble in the organic solvent mixtures of the invention. However, such salts can be readily removed from these dyestuff compositions by well known means, for example, by extraction with an organic solvent. The solvent soluble forms of organic dyestuffs accordingly may contain substantial quantities of coal tar dyestuffs.

A preferred form of organic dyestuffs for use in this invention is as organic salts of the dyestuffs. Such organic salts, for example, may be formed by reaction of an acid or direct dye containing at least one sulfonic acid group or alkali metal salt thereof, with an organic base, such as an amine, for example, dioctyl amine, dicyclohexylamine, ditolyl guanidine, and the like. The preparation of such organic salts of organic dyestuffs is described in the patent literature, for example, in U.S. Pat. 1,647,128; U.S. Pat. 2,095,077 and U.S. Pat. 1,800,300.

Many dyes of the basic dye class are soluble in organic solvents per se or can be rendered soluble by reaction of the cationic portion of the basic dye molecule with an organic acid such as benzoic acid, propionic acid, and the like. (See, for example, British Pat. 1,162,808.)

Exemplary of the dyes suitable for use in conjunction with the solvent mixtures of the present invention are the solvent soluble forms of the following known dyestuffs. (The Color Index numbers, where available, are shown in the last column.)

DISPERSE DYES

C.I.	Disperse	Yellow	1	(C.I. 10345)
C.I.	do	do	3	(C.I. 11855)
C.I.	do	Orange	11	(C.I. 60700)
C.I.	do	Red	11	(C.I. 62015)
C.I.	do	Red	1	(C.I. 11110)
C.I.	do	Red	13	(C.I. 11115)
C.I.	do	Blue	7	(C.I. 62500)
C.I.	do	do	25	(C.I. 62055)
C.I.	do	Yellow	9	(C.I. 10375)
C.I.	do	Red	19	(C.I. 11130)
C.I.	do	Blue	26	(C.I. 63305)
C.I.	do	do	19	(C.I. 61110)

ACID DYES

C.I.	Acid	Blue	40	(C.I. 62125)
C.I.	do	do	25	(C.I. 62055)
C.I.	do	Red	114	(C.I. 23625)
C.I.	do	Blue	113	(C.I. 26360)
C.I.	do	do	102	(C.I. 50320)
C.I.	do	Orange	56	(C.I. 22895)
C.I.	do	do	3	(C.I. 10385)
C.I.	do	Yellow	1	(C.I. 10316)
C.I.	do	do	29	(C.I. 18900)

BASIC DYES

C.I.	Basic	Blue	1	(C.I. 42025)
C.I.	do	do	9	(C.I. 52015)
C.I.	do	do	21	
C.I.	do	do	26	(C.I. 44045)
C.I.	do	Green	4	(C.I. 42000)
C.I.	do	Orange	21	(C.I. 48035)
C.I.	do	do	22	(C.I. 48040)
C.I.	do	Red	13	(C.I. 48015)
C.I.	do	Red	14	
C.I.	do	Violet	7	(C.I. 48020)
C.I.	do	Red	1	(C.I. 45160)
C.I.	do	Red	2	(C.I. 50240)
C.I.	do	Yellow	11	(C.I. 48055)
C.I.	do	do	13	

DIRECT DYES

C.I.	Direct	Red	31	(C.I. 29100)
C.I.	do	Red	81	(C.I. 28160)
C.I.	do	Yellow	12	(C.I. 24895)
C.I.	do	Green	12	(C.I. 30290)
C.I.	do	Blue	55	(C.I. 27940)
C.I.	do	do	67	(C.I. 27925)

The dyestuffs are generally employed from about 0.01 to about 3 parts by weight, and preferably from about 0.02 to about 3 parts by weight of solvent soluble dye per 100 parts of the total solvent mixture. It will be obvious to those skilled in the art that the selection of the dyestuff will depend upon the textile material being dyed and that the composition of the solvent mixture will depend upon the nature of the dyestuff as well as upon the textile material being dyed. Thus, woolen or cellulosic textile materials would call for solvent soluble forms of acid or direct dyestuffs dissolved in solvent mixtures containing water as the swelling agent. Acrylic textile materials would call for solvent soluble forms of basic dyes dissolved in solvent mixtures containing an organic swelling agent for this fiber, such as ethylene carbonate.

The organic dyestuff solvent compositions of the present invention may be used to dye textiles by the same procedures and techniques employed in the aqueous dyeing of textiles. Generally, the dyestuff solution is applied to the textile material, for example, cotton or rayon, by any suitable means, such as by padding, spraying, dipping, flooding, or the like, and the dyestuff impregnated material may then be passed into a zone of perchloroethylene vapors maintained at about 125° to 150° C. for about one minute in order to fix the dyestuff on the fiber.

Alternatively, if the dyeing is done by dipping in a dyestuff solvent bath, fixing may be accomplished in situ by heating the bath. The dyed textile may then be rinsed in a solvent bath and dried. The finished dyed product is colorfast to aqueous soap solutions and dry cleaning solvents.

In the following examples, parts and percentages are by volume and temperatures are given in degrees centigrade unless otherwise specified.

EXAMPLE 1

(A) Five parts of a nonionic surfactant, nonylphenoxy (polyethyleneoxy)ethanol, were dissolved in 10 parts of ethoxy-ethanol. To this solution were added 40 parts of 1,1,1-trichloroethane and 5 parts of water. The resultant mixture was agitated for several minutes after which period a clear solution was obtained. Further additions of water caused the clear solution to become cloudy. However, upon addition of ethoxyethanol, the cloudy solution again became clear.

(B) To a solution of 10 parts of nonylphenoxy (polyethyleneoxy)ethanol in 40 parts of 1,1,1-trichloroethane, a solution of 10 parts of water in 40 parts of ethoxyethanol

was added. The mixture was gently agitated and rapidly became clear and homogeneous.

EXAMPLE 2

A mixture of 100 parts of ethoxyethanol, 10 parts of ethylene carbonate, 200 parts of methylene chloride and 500 parts of 1,1,1-trichloroethane was prepared by mixing the above components in the indicated proportions. The resulting clear solution was used to dissolve 2 parts by weight of the free base form of CI Basic Orange 22 (CI 48040). The resulting clear dyestuff solution was sprayed on a pile fabric composed of 70% by weight of a copolymer of polyvinyl chloride and of acrylonitrile, 20% by weight of a polyacrylonitrile polymer and 10% by weight of nylon. The dye solution impregnated fabric was passed into a chamber and exposed for several minutes to superheated vapors of perchloroethylene at about 143° C. The fabric was then removed from the chamber and allowed to dry in the air at ambient temperature. The fabric was dyed a bright level orange shade. The fixation of the dye thereon was excellent.

EXAMPLE 3

The following experiment illustrates the effect of varying the proportions of the various components of the ternary solvent mixtures of the invention on the clarity or homogeneity of the mixtures. In this experiment, 11 parts of water were mixed with increasing volumes of perchloroethylene and thereafter the volumes of ethoxyethanol required to obtain clear solutions were determined. The water component contained dioctyl sodium sulfosuccinate, an anionic surfactant, in the amount of 1 part by weight of surfactant per 10 parts of water. The results are shown in Table I. (See Fig. 5.) Comparable results are obtained with the same components in the absence of surfactant.

TABLE I

Parts PERC.	Parts EE.	Percent composition		
		H ₂ O	PERC.	EE.
20	46	14.3	26.0	59.7
29	49	12.4	32.6	55.0
35	52	11.2	35.7	53.1
48	57	9.5	41.4	49.1
72	66	7.4	48.3	44.3
94	73	6.2	52.3	41.5
140	81	4.8	60.5	34.7
190	91	3.8	65.0	31.2
240	100	3.1	68.4	28.5
313	112	2.5	71.8	25.7
370	120	2.2	73.8	24.0
450	130	1.9	76.0	22.1

PERC.=Perchloroethylene.
EE.=Ethoxyethanol.

The experiment was repeated using in place of the water component, 11 parts by volume ethylene carbonate (containing 1 part by weight of dioctyl sodium sulfosuccinate). The mixtures giving clear compositions are set out in Table II below. (See Fig. 4.) Comparable results are obtained with the same components in the absence of surfactant.

TABLE II

Volume PERC.	Volume EE.	Percent EC.	Percent PERC.	Percent EE.
10	14	31.4	28.6	40.0
23	18	21.2	44.1	34.7
31	21	17.4	49.2	33.4
46	25	13.4	56.1	30.5
63	31	10.5	60.0	29.5
100	40	7.3	66.3	26.4
174	51	4.7	73.7	21.6
269	61	3.2	78.9	17.9
324	65	2.8	81.0	16.2
400	72	2.3	83.0	14.7

Legend:
EC.=ethylene carbonate.
PERC.=perchloroethylene.
EE.=ethoxyethanol.

EXAMPLE 4

A solution of CI Basic Red 18 250% was prepared by adding 10 parts by weight of the dyestuff to 86 parts of

a 2 to 1 by volume mixture of ethoxyethanol and ethylene carbonate, gently agitating the mixture while heating it to 65° C. and, after permitting the mass to cool to ambient temperature, filtering it to remove about 0.34 part by weight of insoluble material.

A stable, clear solvent solution was prepared by dissolving 25 parts by weight of alkylphenoxypoly(ethyleneoxy)ethanol in 225 parts of ethoxyethanol, and then adding 50 parts of water and 175 parts of perchloroethylene in succession to the mixture.

To this clear solution, 4.4 parts of the dye solution prepared above were added. The resultant solution was clear. This clear solution is suitable for dyeing acrylic textile fibers in fast red shades by the solvent dyeing technique.

EXAMPLE 5

A mixture of 10 parts by weight of C.I. Basic Blue 45 480%, 60 parts by weight of ethoxyethanol and 30 parts by weight of ethylene carbonate, was warmed to 50° C. The mixture was agitated at 50° C. for five minutes and then permitted to cool to ambient temperature after which the mass was filtered to remove about 2 parts of insoluble material.

A solvent mixture was prepared by dissolving 15 parts by weight of the isopropylamine salt of dodecylbenzene sulfonic acid (M.W. 350) in 310 parts of ethoxyethanol, then adding in succession to the solution 30 parts of water and 750 parts of perchloroethylene. A clear solution resulted.

A dye solution was prepared by mixing 2.08 parts by weight of the C.I. Basic Blue 45 solution, prepared above, with 97.92 parts by weight of the solvent mixture, prepared above. The resulting solution was padded on 13 parts by weight of an acrylic textile. The padded material was passed through squeeze rollers to adjust the pick-up of dye solution to 16 parts by weight. The impregnated cloth was passed into a zone of solvent vapors, heated to about 145° C. and held therein for about 3 minutes. The cloth was next passed into about 190 parts of perchloroethylene and the solvent-scoured cloth was dried. The dried cloth was then washed in a bath containing 1000 parts of water and 2 parts by weight of an alkylaryl sulfonate detergent.

The acrylic textile was dyed a deep blue, which dyeing had excellent wash fastness as evidenced by the clarity and color free nature of the washing liquor. The dyeing also possessed excellent fastness to crocking which indicates that the fixation of the dye on the fabric was excellent.

We claim:

1. A clear, stable, homogenous solvent solution composition which consists essentially of a three component mixture of:

(A) about 25-94% by volume of a stable halogenated hydrocarbon boiling within the range of about 40 to about 180° C.,

(B) about 0.1 to 5% by volume of a polar liquid which is a swelling agent for a textile fiber and which is substantially insoluble in the halogenated hydrocarbon, and

(C) about 5 to 75% by volume of an organic liquid boiling within the range of about 75° C. to about 180° C. which is soluble in each of the halogenated hydrocarbon and the polar liquid to the extent of at least about 5% by weight which organic liquid is selected from the group consisting essentially of 1-methoxy-2-hydroxypropane, and an alkoxyethanol.

2. A solvent composition as defined in claim 1 containing from about 50-85% by volume of the halogenated hydrocarbon, from about .2 to 5% by volume of the polar liquid and from about 7 to 40% by volume of the organic liquid.

3. A solvent composition as defined in claim 1 containing from about 70-85% by volume of the halogenated hydrocarbon, from about 3 to 5% by volume of the polar

liquid and from about 10 to 35% by volume of the organic liquid.

4. A solvent composition as defined in claim 1 in which the halogenated hydrocarbon is perchloroethylene.

5. A clear, stable, homogenous solvent solution composition which comprises a mixture of:

(A) about 25 to 94% by volume of a stable halogenated hydrocarbon boiling within the range of about 40 to about 180° C.,

(B) about 0.1 to 5% by volume of a polar liquid which is a swelling agent for a textile fiber and which is substantially insoluble in the halogenated hydrocarbon, and

(C) about 5 to 75% by volume of 1-methoxy-2-hydroxypropane.

6. A solvent composition as defined in claim 1 in which the halogenated hydrocarbon is 1,1,1-trichloroethane.

7. A solvent composition as defined in claim 1 in which the polar liquid is water.

8. A solvent composition as defined in claim 1 in which the polar liquid is an alkylene carbonate.

9. A solvent composition as defined in claim 1 in which the organic liquid is ethylene glycol monoethyl ether.

10. A clear, stable, homogenous solvent solution composition which comprises a mixture of:

(A) about 25 to 94% by volume of a stable halogenated hydrocarbon boiling within the range of about 40 to about 180° C.,

(B) about 0.1 to 5% by volume of a polar liquid which is a swelling agent for a textile fiber and which is substantially insoluble in the halogenated hydrocarbon, and

(C) about 5 to 75% by volume of an alkoxyethanol.

11. A solvent composition as defined in claim 1 containing as an additional component a nonionic or an anionic surfactant.

12. A solvent composition as defined in claim 5 in which the halogenated hydrocarbon is perchloroethylene, the polar liquid is ethylene carbonate, the organic liquid is 1-methoxy-2-hydroxypropane, and in which the volume proportions of the recited components in the mixture are defined by the area within the closed curve shown in FIG. 1.

13. A solvent composition as defined in claim 12 containing as an additional component a nonionic or an anionic surfactant.

14. A solvent composition as defined in claim 10 in which the halogenated hydrocarbon is perchloroethylene, the polar liquid is ethylene carbonate, the organic liquid is methoxyethanol, and in which the volume proportions of the recited components in the mixture are defined by the area within the closed curve shown in FIG. 3.

15. A solvent composition as defined in claim 14 containing as an additional component a nonionic or anionic surfactant.

16. A solvent composition as defined in claim 13 in which the halogenated hydrocarbon is perchloroethylene, the polar liquid is ethylene carbonate, the organic liquid is ethoxyethanol and in which the volume proportions of the recited components in the mixture are defined by the area within the closed curve shown in FIG. 4.

17. A solvent composition as defined in claim 16 containing as an additional component a nonionic or an anionic surfactant.

18. A solvent composition as defined in claim 13 in which the halogenated hydrocarbon is perchloroethylene, the polar liquid is water, the organic liquid is ethoxyethanol, and in which the volume proportions of the recited components in the mixture are defined by the area within the closed curve shown in FIG. 5.

19. A solvent composition as defined in claim 18 containing as an additional component a nonionic or an anionic surfactant.

20. A dyestuff composition comprising an organic dyestuff dissolved or dispersed in a clear, stable, homogeneous solvent composition as defined in claim 1.

21. A dyestuff composition comprising an organic dyestuff dissolved or dispersed in a clear, stable, homogeneous solvent composition as defined in claim 4.

22. A dyestuff composition comprising an organic dyestuff dissolved or dispersed in a clear, stable, homogeneous solvent composition as defined in claim 5.

23. A dyestuff composition comprising an organic dyestuff dissolved or dispersed in a clear, stable, homogeneous solvent composition as defined in claim 6.

24. A dyestuff composition comprising an organic dyestuff dissolved or dispersed in a clear, stable, homogeneous solvent composition as defined in claim 7.

25. A dyestuff composition comprising an organic dyestuff dissolved or dispersed in a clear, stable, homogeneous solvent composition as defined in claim 8.

26. A dyestuff composition comprising an organic dyestuff dissolved or dispersed in a clear, stable, homogeneous solvent composition as defined in claim 9.

27. A dyestuff composition comprising an organic dyestuff dissolved or dispersed in a clear, stable, homogeneous solvent composition as defined in claim 10.

28. A dyestuff composition comprising an organic dyestuff dissolved or dispersed in a clear, stable, homogeneous solvent composition as defined in claim 11.

29. A dyestuff composition comprising an organic dyestuff dissolved or dispersed in a clear, stable, homogeneous solvent composition as defined in claim 12.

30. A dyestuff composition comprising an organic dyestuff dissolved or dispersed in a clear, stable, homogeneous solvent composition as defined in claim 13.

31. A dyestuff composition comprising an organic dyestuff dissolved or dispersed in a clear, stable, homogeneous solvent composition as defined in claim 14.

32. A dyestuff composition comprising an organic dyestuff dissolved or dispersed in a clear, stable, homogeneous solvent composition as defined in claim 15.

33. A dyestuff composition comprising an organic dyestuff dissolved or dispersed in a clear, stable, homogeneous solvent composition as defined in claim 16.

34. A dyestuff composition comprising an organic dyestuff dissolved or dispersed in a clear, stable, homogeneous solvent composition as defined in claim 17.

35. A dyestuff composition comprising an organic dyestuff dissolved or dispersed in a clear, stable, homogeneous solvent composition as defined in claim 18.

36. A dyestuff composition comprising an organic dyestuff dissolved or dispersed in a clear, stable, homogeneous solvent composition as defined in claim 19.

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U.S. Cl. X.R.

8—94

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,788,811 Dated January 29, 1974

Inventor(s) Frederic Leroy Sievenpiper & Elmore Bement

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Col. 3, line 40 - "1,1,2,2-tetrachloro-2,2-difluoroethane"
should read -- 1,1,1,2-tetrachloro-2,2-
difluoroethane --;

Col. 9, line 56 (claim 16) - "13" should read -- 10 --;

col. 9, line 65 (claim 18) - "13" should read -- 10 --.

Signed and sealed this 24th day of September 1974.

(SEAL)
Attest:

McCOY M. GIBSON JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents