PATENT SPECIFICATION (11) 1 275 981

NO DRAWINGS

(21) Application No. 41073/69 (22) Filed 18 Aug. 1969

(31) Convention Application No. 13051 (32) Filed 30 Aug. 1968

(31) Convention Application Nos. 18943 and 18944

(32) Filed 19 Dec. 1968 in

(33) Switzerland (CH)

(45) Complete Specification published 1 June 1972

(51) International Classification C09B 43/00

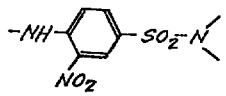
(52) Index at acceptance
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(54) MONO- AND DIS-AZO COMPOUNDS, THEIR PRODUCTION AND USE AS DISPERSE DYES

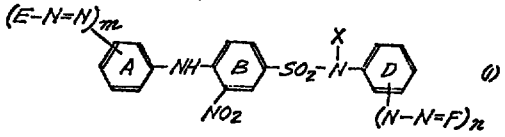
(71) We, SANDOZ LTD. of Lichtstrasse 35, Basle, Switzerland, a Body Corporate organised according to the laws of Switzerland, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to azo compounds of low solubility in water, which contain at least four nuclei of aromatic character, one of which is of formula



These new compounds are outstandingly suitable for dyeing and printing fibres consisting of synthetic or semi-synthetic, hydrophobic organic compounds of high molecular weight, and of textile materials manufactured with these fibres.

The new compounds have the general formula



(1)

where E stands for a phenyl radical which may be substituted by one or more chlorine or bromine atoms, lower alkyl, lower alkoxy, trifluoromethyl, nitro, cyano, thiocyanato, phenoxy, formyl, acetyl, benzoyl, lower alkylsulphonyl, lower hydroxyalkylsulphonyl, benzylsulphonyl, aminosulphonyl, methylaminosulphonyl, cyanoethylaminosulphonyl, hydroxyethylaminosulphonyl, phenylaminosulphonyl, formylamino, lower alkanoylamino, chloropropionylamino, lower alkylsulphonylamino, lower alkoxycarbonyl, benzyloxycarbonyl, lower alkoxycarbonylamino, aminocarbonyl, lower alkylaminocarbonyl or phenylaminocarbonyl groups; for a naphthalene radical which may be substituted by a methylsulphonyl group; for a thiazole radical which may be substituted by chlorine or bromine atoms, methyl, methoxy, nitro, methylsulphonyl or trifluoromethyl groups; for a benzothiazole radical which may be substituted by one or more chlorine or bromine atoms, or a nitro, cyano, methylsulphonyl, methoxy, trifluoromethyl, aminosulphonyl, lower alkylaminosulphonyl, hydroxyethylaminosulphonyl or a methoxypropylaminosulphonyl group; for a pyrazole radical which may be substituted by one or more methyl, benzyl or phenyl groups; for a 4-aminocarbonylimidazole radical; for a 4-phenylthiadiazole - (1,3,5) - radical; for a thiophene radical; for a quinoline radical or for a tetrazole radical;

F for a phenyl, naphthyl, thiazolyl, benzothiazolyl, pyrazolyl, imidazolyl, thiadiazolyl, thienyl, quinolyl, tetrazolyl or acetoacetic acid anilide radical which may be substituted;

X for a hydrogen atom or an optionally substituted alkyl group;

m for 0 or 1, and

n for 0 or 1,

where the sum of m and n is at least 1; and where the rings A, B and D may each bear one or more further substituents and the molecule is free from sulphonic acid groups.

[*Price 25p*]

In preferred dyestuffs of formula (I), the symbols have the following meanings:

F stands for a phenyl radical which may be substituted by one or more chlorine or bromine atoms, lower alkyl, lower alkoxy, phenoxy, trifluoromethyl, thiocyanato, cyano, nitro, hydroxyl, formyl, acetyl, benzoyl, lower alkylsulphonyl, hydroxyethylsulphonyl, benzylsulphonyl, aminosulphonyl, lower alkylaminosulphonyl, cyanoethylaminosulphonyl, hydroxyethylaminosulphonyl, phenylaminosulphonyl, lower alkylamino, cyanoethylamino, formylamino, lower alkanoylamino, chloropropionylamino, methylsulphonylamino, lower alkoxycarbonyl, benzyloxycarbonyl, lower alkoxycarbonylamino, aminocarbonyl, lower alkylaminocarbonyl or phenylaminocarbonyl groups; for a naphthalene radical which may be substituted by a methylsulphonyl group; for a benzothiazole radical which may be substituted by one or more chlorine or bromine atoms or a nitro, cyano, methylsulphonyl, methoxy, trifluoromethyl, aminosulphonyl, methylaminosulphonyl, ethylaminosulphonyl, hydroxyethylaminosulphonyl or methoxypropylaminosulphonyl group; for a pyrazole radical which may be substituted by one or more lower alkyl, hydroxyl, amino, carboxylic acid amide or phenyl groups; for a 4-aminocarbonylimidazole radical; for a 4 - phenylthiadiazole - (1,3,5) radical; for a thiophene radical; for a quinoline radical; for a hydroxyquinoline radical; for a tetrazole radical or for an acetoacetic acid anilide radical;

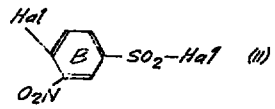
X for a hydrogen atom or a lower alkyl group which may be substituted by one or more chlorine or bromine atoms, hydroxyl, cyano, lower alkanoyloxy, benzoyloxy, lower alkoxycarbonyloxy, lower alkoxycarbonyl, aminocarbonyl, benzyloxycarbonyloxy, lower alkoxy, phenoxy, pyridyl, aminocarbonyl, dimethylaminocarbonyloxy or phenylaminocarbonyloxy groups;

and where the ring A may bear as substituents one or more chlorine or bromine atoms, lower alkyl, lower alkoxy, formylamino, lower alkanoylamino, benzoylamino, lower alkoxycarbonylamino, benzyloxycarbonylamino or chloropropionylamino groups; the ring B may bear a further nitro group; and the ring D may be one or more chlorine or bromine atoms, lower alkyl, lower alkoxy, phenoxy, hydroxyl, cyano, nitro, thiocyanato, hydroxyethoxy, lower alkanoyloxyethoxy, formylamino, lower alkanoylamino, benzoylamino, lower alkylsulphonyl, benzylsulphonyl, phenylsulphonyl, aminosulphonyl, lower alkylaminosulphonyl, acetyl, benzoyl, aminocarbonyl, lower alkylaminocarbonyl, methoxypropylaminocarbonyl groups or, in the 3,4-positions, a group of formula

$$-CH_2-O-CH_2-O-.$$

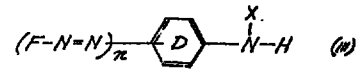
The term "lower" indicates that the respective groups contain 1, 2, 3 or 4 carbon atoms.

The azo compounds of formula (I) may be produced by condensation of one mole of a compound of formula



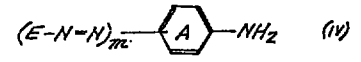
(II)

where Hal represents a chlorine or bromine atom, with one mole of an amine of formula



(III)

and one mole of an amine of formula

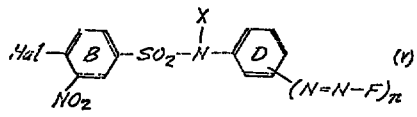


(IV)

The condensation reaction is generally conducted in a solvent under conditions under which the solvent is essentially non-reactive towards the $-SO_2Hal$ group. Suitable solvents are water, ethanol, n-butanol, benzyl alcohol, ethylene glycol, polyethylene glycol, benzene, toluene, xylene, and chlorobenzene. Temperatures in the range of 25°C to 200°C may be used provided that the solvent is essentially non-reactive towards the $-SO_2Hal$ group at the chosen temperature. It is usually of advantage to include an acid-binding agent in the reaction mixture, e.g. alkali metal carbonates, bicarbonates or acetates, magnesium oxide or calcium oxide.

Since the halogen atom attached to the $-SO_2-$ group in the compound of formula (II) is more highly reactive than the halogen atom bound to the nucleus, the first noted amine of formula (III) is bound to the $-SO_2-$ group while the amine of formula (IV) is subsequently bound directly to the nucleus B. It is desirable to effect the first stage of the reaction at a temperature below 100°C and the second stage in the range of about 80°C to 200°C, employing an autoclave if necessary.

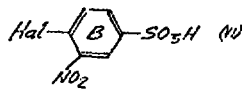
A second mode of operation for producing compounds of formula (I) is to melt one mole of a compound of formula



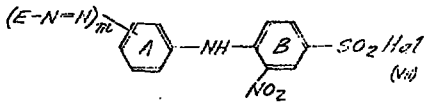
(V)

and one mole of an amine of formula (IV) and to condense the two in the presence of one of the afore-named acid-binding agents at a suitable temperature between 100°C and 220°C.

A further route of synthesis for compounds of formula (I) comprises condensing one mole of a compound of formula

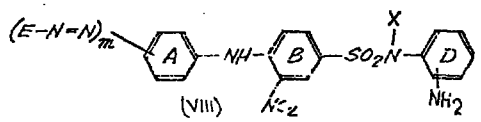


and one mole of an amine of formula (IV), converting the resulting compound with a halogenating agent, e.g. phosphorus trichloride or thionyl chloride, into the sulphonic acid chloride or bromide of formula



and condensing this with one mole of an amine of formula (III). Here the condensation reaction of the compound of formula (VI) with the amine of formula (IV) is carried out, preferably in one of the afore-named solvents, at temperatures in the range of about 30°C to 200°C, whilst the condensation of the compound of formula (VII) with the amine of formula (III) is effected preferably in the same medium in the range of 25°C to 130°C.

A further method of production yielding compounds of formula (I) in which n = 1 comprises the diazotization of a compound of formula



followed by coupling with a compound of formula

F—H (IX).

In the especially preferred dyes of formula (I) the sum of m and n is 1.

Mixtures of dyes of formula (I) also exhibit outstandingly good properties. These mixtures can be obtained, for example, by reacting 1 mole of a compound of formula (IV) with 1 mole of a mixture of different compounds of formula (V) or by reacting 1 mole of a mixture of different compounds of formula (IV) with 1 mole of a compound of formula (V).

It is of great advantage to convert the new dyes into dye preparations before their application, using the known methods for this purpose, e.g. grinding in the presence of dispersing agents and/or fillers, with subsequent vacuum or spray drying if dry preparations are desired. After the addition of a suitable volume of water the dyes can be applied to the substrate by exhaustion dyeing, pad dyeing or printing methods at long or short liquor ratio.

From aqueous dispersions the dyes build up excellently on textile materials consisting of synthetic or semi-synthetic organic substances of hydrophobic character and high molecular weight. They are especially suitable for dyeing and printing textiles of linear aromatic polyester fibres, cellulose diacetate, cellulose triacetate and polyamide fibres. They are also dyeable on polyolefins.

The known exhaustion dyeing, pad dyeing and printing methods are employed, for example the process described in French Patent 1,445,371.

The dyeings obtained are of yellow shade and are extremely fast, showing excellent fastness to heat treatments (thermofixation, sublimation, pleating), gas fumes, cross dyeing, dry cleaning, chlorine and wet tests such as washing, water and perspiration. They are highly stable to the conditions of the pre-cure and post-cure permanent press finishing process. The dischargeability and the reserve of wool and cotton are good. Their fastness to light is outstandingly good, even in pale shades, which makes the new dyes extremely suitable as components for the production of fashionable pastel combination shades. At temperatures in the range of 80°C to 140°C the dyes are resistant to reduction by boiling: this stability is not adversely affected by the liquor ratio or by the presence of dyeing accelerants.

In the following Examples the parts are by weight and the temperatures in degrees centigrade.

Example 1

A mixture of 25.6 parts of 1 - chloro - 2 - nitrobenzene - 4 - sulphonic acid chloride, 19.7 parts of 4 - amino - 1,1′ - azobenzene, 250 parts of ethylene glycol and 20 parts of anhydrous sodium acetate is raised to 50° in 30 minutes and stirred at this temperature for 2 hours. 12.8 Parts of 1 - amino - 4 - chlorobenzene are added to the reaction mixture and the temperature is then increased over 1 hour to 150°. After stirring for 3 hours at 150—155° the reaction mixture is allowed to cool to room temperature, on which the dye settles out in crystalline form. It is filtered off, washed with a little ethanol and then with hot water, and finally dried. On synthetic fibres the dye thus obtained gives dyeings of yellow shade which have excellent fastness properties.

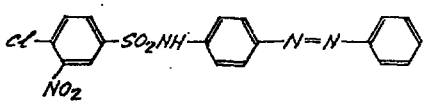
Example 2

A mixture of 31.3 parts of 1 - chloro - 2 - nitrobenzene - 4 - sulphonic acid phenylamide, 19.7 parts of 4 - amino - 1,1′ - azobenzene, 80 parts of a commercially available liquid polyethylene glycol and 10 parts of anhydrous sodium acetate is raised to 160° in 30 minutes with vigorous stirring, stirred for a further 24 hours at 160—165° and then allowed to cool to about 70°. At this temperature the reaction mixture is diluted with 100 parts of ethanol, after which 40 parts of water are added very slowly. The dye settles out and after 2 hours it is filtered off, washed with some ethanol and then with hot water, and dried. The

pure dye, applied to synthetic fibres, gives reddish yellow dyeings having excellent fastness properties.

EXAMPLE 3

A mixture of 31.7 parts of the compound of formula



the production of which is described in Example 1, 9.3 parts of aniline, 200 parts of ethylene glycol and 10 parts of anhydrous sodium acetate is raised over 40 minutes to 145° and reacted for 2 hours at 145—150° with stirring. After this time the mixture is allowed to cool to 20—30°. The dye settles out in crystalline form and is filtered off, washed with some ethanol and then with hot water and subsequently dried. Yellow dyeings of excellent all-round fastness are obtained with this dye on synthetic fibre materials.

EXAMPLE 4

A mixture of 25.6 parts of 1 - chloro - 2 - nitrobenzene - 4 - sulphonic acid chloride, 39.4 parts of 4 - amino - 1,1' - azobenzene, 250 parts of ethylene glycol and 20 parts of anhydrous sodium acetate is raised to 80° in 2 hours with thorough stirring. The temperature is held at 80° for 1 hour, then at 150° for 3 hours and subsequently at 170° for 2 hours. After this time the reaction mixture is allowed to cool to 70° and is diluted with 100 parts of ethanol. Cooling is allowed to continue and the precipitated dye is filtered off at room temperature. It is washed with ethanol and then with hot water and dried. The dye thus obtained dyes synthetic fibres in yellow shades with excellent fastness properties.

EXAMPLE 5

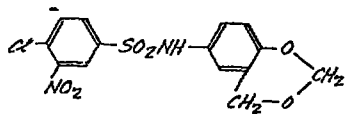
A mixture of 32.7 parts of 1 - chloro - 2 - nitrobenzene - 4 - sulphonic acid - (3' - methyl) - phenylamide, 34.3 parts of 1 - chloro - 2 - nitrobenzene - 4 - sulphonic acid - (2' - methoxy) - phenylamide), 39.4 parts of 4 - amino - 1,1' - azobenzene and 30 parts of anhydrous sodium acetate is brought to 170—180° over 30 minutes, on which a melt is formed which is stirred for 8—12 hours at the same temperature. It is then allowed to cool to 150°, at which point 40 parts of ethylene glycol are added, and then to 90°, when 80 parts of ethanol are added, followed after a few minutes by 40 parts of water. The mixture is vigorously stirred for 1 hour at 80°, after which time the precipitated product is filtered off. The filtercake is washed with a little cold ethanol and then with ample hot water and finally dried. The dye mixture thus obtained gives dyeings of reddish yellow shade on polyester fibres which have excellent fastness properties.

EXAMPLE 6

A mixture of 31.3 parts of 1 - chloro - 2 - nitrobenzene - 4 - sulphonic acid phenylamide, 34.3 parts of 1 - chloro - 2 - nitrobenzene - 4 - sulphonic acid - (2' - methoxy) - phenylamide, 32.7 parts of 1 - chloro - 2 - nitrobenzene - 4 - sulphonic acid - (3' - methyl) - phenylamide, 59.1 parts 4 - amino - 1,1' - azobenzene and 45 parts of anhydrous sodium acetate is raised to 160—180° in 30 minutes to form a melt which is stirred for 8 to 12 hours at this temperature. It is then allowed to cool to 150°, on which 70 parts of ethylene glycol are added, and then further to 90°, at which point 150 parts of ethanol are added, followed after a few minutes by 70 parts of water. Vigorous stirring is maintained for 1 hour at 80° causing precipitation of the dye of mixed constitution formed by the reaction. The filtercake is washed with cold methanol and then with abundant hot water and finally dried. The dye mixture yielded by this procedure gives dyeings of reddish yellow shade on polyester fibres which have excellent all-round fastness.

EXAMPLE 7

A mixture of 37.1 parts of the compound of formula



15 parts of anhydrous sodium acetate and 19.7 parts of 4 - amino - 1,1' - azobenzene is raised to 170° in 30 minutes and the resulting melt is stirred for 15 hours at 160—175°. After partial cooling to 150° 20 parts of ethylene glycol are added, then cooling is continued to 90° for the addition of 50 parts of ethanol and after a few minutes 30 parts of water. The mixture is stirred thoroughly for a further hour at 80° which causes the dye to settle out. It is filtered off, washed with a little cold ethanol and then with ample hot water and finally dried. The dye thus obtained dyes synthetic fibres in reddish fibres in reddish yellow shades which have excellent fastness properties.

EXAMPLE 8

A mixture of 32.7 parts of 1 - chloro - 2 - nitrobenzene - 4 - sulphonic acid - (3' - methyl) - phenylamide, 35.5 parts of 1 - chloro - 2 - nitrobenzene - 4 - sulphonic acid - N - ethyl - N - (3' - methyl) - phenylamide, 39.4 parts of 4 - amino - 1,1' - azobenzene and 30 parts of anhydrous sodium acetate is heated up to 170—180° over 30 minutes to form a melt which is stirred for 8—12 hours at the same temperature. It is allowed to cool to 150°, on which 40 parts of ethylene glycol are added, then cooling is continued to 90°, at which point 80 parts of ethanol and after a few minutes 40 parts of

water are added. The mixture is vigorously stirred for 1 hour at 80° and then some cold ethanol and then with ample hot water and finally dried. This procedure results in a dye mixture which gives dyeings of reddish yellow shade on polyester fibres having excellent fastness properties.

EXAMPLE 9

A mixture of 39.9 parts of 1 - bromo - 2 - nitrobenzene - 4 - sulphonic acid - N - ethyl - N - (3′ - methyl) - phenylamide, 19.7 parts of 4 - amino - 1,1′ - azobenzene and 35 parts of anhydrous sodium acetate is raised to 150° in 30 minutes and the resulting melt stirred for 10 hours at 145—150°. It is allowed to cool to 120°, on which 20 parts of ethylene glycol are entered, and then to 90° for the addition of 40 parts of ethanol followed in a few minutes by 15 parts of water. The mixture is vigorously stirred for 2 hours at 70—80°. The precipitated product is then filtered off, washed with some cold ethanol and then with ample hot water and dried. The dye thus obtained dye synthetic fibres in reddish yellow shades with excellent fastness properties.

EXAMPLE 10

A mixture of 32.7 parts of 1 - chloro - 2 - nitrobenzene - 4 - sulphonic acid - N - methylphenylamide, 19.7 parts of 4 - amino - 1,1′ - azobenzene, 80 parts of a commercially available liquid polyethylene glycol and 15 parts of anhydrous sodium acetate is raised to 160° in 30 minutes with vigorous stirring and stirred for 24 hours at 160—170°. It is then allowed to cool to about 70°. At this temperature the reaction mixture is diluted with 100 parts of ethanol and when 2 hours have elapsed the precipitated dye is filtered off. It is washed with a little ethanol and then with hot water and dried. The purified dye gives dyeings of reddish yellow shade on synthetic fibres showing excellent all-round fastness.

EXAMPLE 11

A mixture of 40 parts of 1 - chloro - 2,6 - dinitrobenzene - 4 - sulphonic acid - N - ethyl - N - (3′ - methyl) - phenylamide, 19.7 parts of 4 - amino - 1,1′ - azobenzene, 15 parts of anhydrous sodium acetate and 200 parts of ethylene glycol is brought to 140°, stirred for 2—3 hours at 140—150 and then allowed to cool to 20—30°. The dye, which settles out in crystalline form, is filtered off, washed with some ethanol and then with hot water and dried. On synthetic fibres the dye obtained by this procedure gives dyeings of yellow shade having outstandingly good fastness properties.

DYEING EXAMPLE 1

A mixture of 7 parts of the dye obtained as specified in Example 1, 4 parts of sodium dinaphthylmethanedisulphonate, 4 parts of sodium cetylsulphate and 5 parts of sodium sulphate is ground in a ball mill for 48 hours to give a fine powder. Two parts of the powder are dispersed in 3000 parts of water set with 3 parts of a 30% solution of a highly sulphonate castor oil and 20 parts of an emulsion of a chlorinated benzene. Into this dyebath 100 parts of a fabric of polyester fibre are entered at 20—25°, on which the bath temperature is increased to 95—100° in about 30 minutes and the fabric dyed for 1 hour at this temperature. It is then removed, washed off, soaped for 15 minutes at 70° with a 0.1% solution of an alkylphenylpolyglycol ether, rinsed and dried. A yellow dyeing having excellent fastness properties is obtained.

DYEING EXAMPLE 2

A mixture of 30 parts of the dye obtained as given in Example 2, 40 parts of sodium dinaphthylmethanedisulphonate, 50 parts of sodium cetylsulphate and 50 parts of anhydrous sodium sulphate is ground in a ball mill for 48 hours to form a fine powder. 4 Parts of this dye powder are dispersed in 1000 parts of water at 40—50° and 100 parts of a scoured fabric of polyester fibre are entered into the bath. The bath is raised slowly to 130° and the fabric dyed for about 1 hour at this temperature under pressure. Subsequently it is washed off, soaped, rinsed and dried. The yellow dyeing produced on the polyester fabric has excellent fastness properties.

DYEING EXAMPLE 3

A fine aqueous dispersion of 30 parts of the dye mixture obtained by the procedure of Example 6, 70 parts of sodium dinaphthylmethanedisulphonate and 3 parts of sodium alginate is made up to 1000 parts with water and thoroughly mixed. This padding liquor is applied to a polyester fabric at 20° and after intermediate drying in air at 60—100° the pad dyeing is fixed by exposure for 60 seconds in a dry air atmosphere at 230°. After fixation the fabric is rinsed, soaped, rinsed again and dried. The level yellow dyeing thus produced has good all-round fastness.

DYEING EXAMPLE 4

A mixture of 15 parts of the dye of Example 1, 20 parts of sodium dinaphthylmethanedisulphonate, 25 parts of sodium cetylsulphate and 25 parts of anhydrous sodium sulphate is ground in a ball mill for 48 hours to form a fine powder. 5 Parts of this dye preparation are dispersed in 4000 parts of water and into this bath 100 parts of a scoured fabric of cellulose triacetate fibre are entered. The bath temperature is raised slowly to 95—100° and the fabric dyed for one hour at this temperature. On removal it is washed off, soaped for 15 minutes at 70° with

a 0.1% solution of an alkylphenolpolyglycol ether, rinsed and dried. A red dyeing with good fastness properties is obtained.

DYEING EXAMPLE 5

A mixture of 7 parts of the dye of Example 7, 4 parts of sodium dinaphthylmethanedisulphonate, 4 parts of sodium cetylsulphate and 5 parts of anhydrous sodium sulphate is ground in a ball mill for 48 hours. A fine powder is formed, 2 parts of which are dispersed in 3000 parts of water containing 3 parts of a 30% solution of a highly sulphonated castor oil. At 20—25° 100 parts of a cellulose diacetate fabric are entered, the bath is raised to 80—82° in about 30 minutes and the fabric dyed for 1 hour at this temperature. It is then removed, washed off, soaped, rinsed and dried. A reddish yellow dyeing having good fastness properties is obtained.

DYEING EXAMPLE 6

In a ball mill a mixture of 7 parts of the dye of Example 7, 13 parts of powder from spent sulphite cellulose liquor and 100 parts of water is ground to a paste which is dried in an injection dryer. 4 Parts of the paste are dispersed in a little water and the dispersion is run through a sieve into a bath of 4000 parts of water set with 4 parts of N - oleyl - N' - hydroxyethyl - N' - (3' - sulpho - 2' - hydroxypropyl) - ethylenediamine. 100 Parts of a fabric of nylon polyamide fibre are entered into the bath at 20°, the bath is raised to 100° in 30 minutes and the fabric dyed for 1 hour at this temperature, with subsequent rinsing and drying. The reddish yellow dyeing thus produced is level and has good fastness properties.

The dyes listed in the following table conform to the general formula

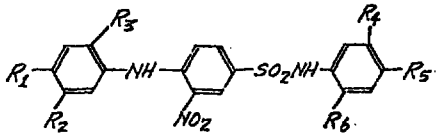


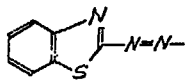
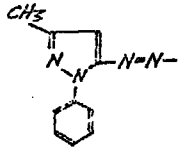
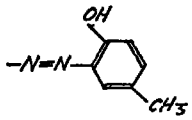
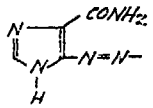
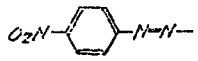
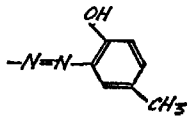
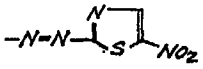
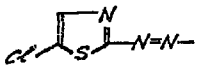
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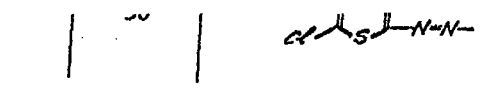
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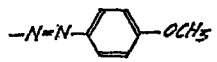
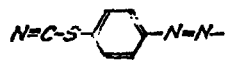
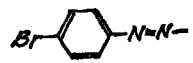
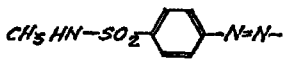
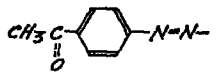
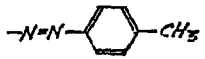
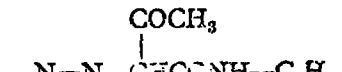
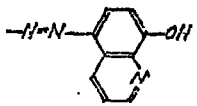
TABLE I

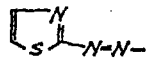
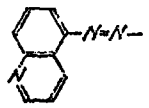
Example	R_1	R_2	R_3	R_4	R_5	R_6	Shade on Polyester fibre
12	$H_5C_6—N=N—$	H	H	H	—Cl	H	reddish yellow
13	do.	H	H	H	H	—OH	do.
14	do.	H	H	H		H	do.
15	H	H	H	H		H	yellow
16		H	H	H	H	H	reddish yellow
17	do.	H	H	H		H	do.
18		$—CH_3$	$—OCH_3$	H	H	H	do.
19		$—OCH_3$	H	H	H	H	do.
20	H	H	H		H	H	yellow
21	H	—Cl	H	H	$—N=N—C_6H_5$	H	do.
22		H	H	H	H	H	reddish yellow

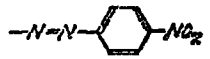
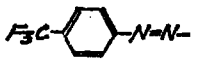
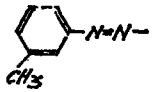
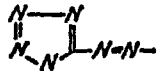
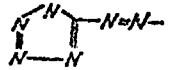
Example	R_1	R_2	R_3	R_4	R_5	R_6	Shade on Polyester fibre
23		H	H	H	H	H	reddish yellow
24		H	H	H	H	H	do.
25	H_5C_6—N=N—	H	H	H		H	do.
26		H	H	—CH_3	H	H	do.
27		H	H	H		H	do.
28	H_5C_6—N=N—	—NHCO—CH_3	H	H	H	H	reddish yellow
29	do.	H	H	H		H	do.
30		H	H	H	H	H	do.

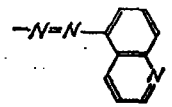
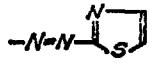
Example	R_1	R_2	R_3	R_4	R_5	R_6	Shade on

		H	H	H	H	H	do.

Example	R_1	R_2	R_3	R_4	R_5	R_6	Shade on Polyester fibre
31	H	H	H	H		H	yellow
32		H	H	H	H	H	reddish yellow
33		H	H	H	H	H	do.
34		H	H	H	H	H	do.
35		H	H	H	H	H	do.
36	H	H	H	H		H	yellow
37		H	H	$-CH_3$	H	H	reddish yellow
38	H	H	H	H		H	yellow
39	H	H	H	H		H	do.

Example	R_1	R_2	R_3	R_4	R_5	R_6	Shade on Polyester fibre
40	$H_5C_6—N=N—$	H	H	H	$—OCH_3$	H	reddish yellow
41	do.	H	H	H	H	$—OCH_3$	do.
42	do.	H	H	$—OCH_3$	H	H	do.
43	do.	H	H	$—OCH_3$	H	$—OCH_3$	do.
44	do.	H	H	H	$—OCH_3$	$—OCH_3$	do.
45	do.	H	H	$—CH_3$	H	H	do.
46	do.	H	H	H	$—CH_3$	H	do.
47	do.	H	H	H	H	$—CH_2$	do.
48	do.	H	H	—Cl	H	H	do.
49	do.	H	H	H	H	—Cl	do.
50	do.	H	H	H	$—OCH_2CH_2OH$	H	do.
51	do.	H	H	H	$—OCH_2CH_2O.COCH_3$	H	do.
52	do	H	H	H	$—CH_3$	$—CH_3$	do.
53		H	H	$—CH_3$	H	H	do.
54		H	H	$—CH_3$	H	H	do.

Example	R_1	R_2	R_3	R_4	R_5	R_6	Shade on Polyester fibre
48	H_5C_6—N=N—	H	H	$—CH_3$	H	$—CH_3$	reddish yellow
49	do.	$—CH_3$	H	$—CH_3$	H	H	do.
50	do.	H	H	H	Cl	$—CH_3$	do.
51	do.	H	H	Cl	H	$—CH_3$	do.
52	do.	H	H	H	$—OCH_2CH_2$	H	do.
53	do.	H	H	$—CH_3$	$—CH_3$	H	do.
54	do.	H	$—OCH_3$	$—CH_3$	H	H	do.
55	do.	H	H	H		H	do.
56		H	$—C_2H_5$	H	H	$—C_2H_5$	do.
57		—NHCHO	H	H	$—O—C_6H_5$	H	do.
58	H_5C_6—N=N—	H	H	H	$—NHCOCH_2CH_3$	H	do.
59		H	H	$—CH_3$	H	H	do.
60	H	H	H	H		H	do.

Example	R_1	R_2	R_3	R_4	R_5	R_6	Shade on Polyester fibre
68	H	H	H	H		H	reddish yellow
69	H	H	H	H		H	do.

The dyes set forth in the following Table II conform to the formula

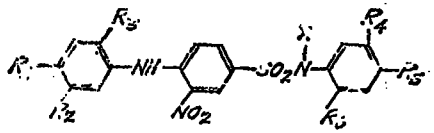
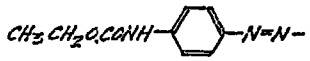
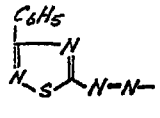
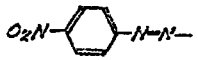
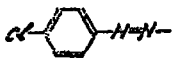
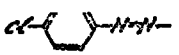


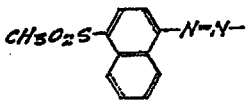
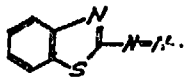
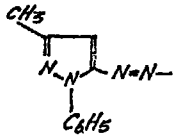
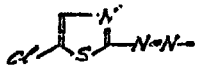
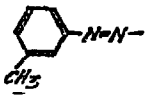
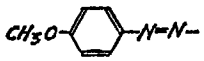
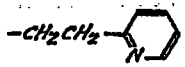
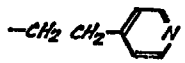
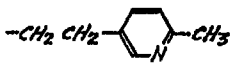
TABLE II

TABLE II

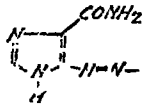
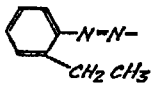
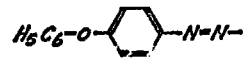
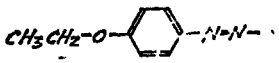
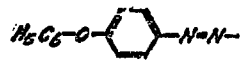
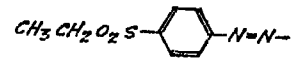
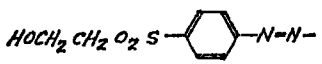
Example	X	R_1	R_2	R_3	R_4	R_5	R_6	Shade on Polyester fibre
70	$-CH_3$	$H_5C_6-N=N-$	H	H	$-CH_3$	H	H	reddish yellow
71	do.	do.	H	H	H	$-CH_3$	H	do.
72	do.	do.	H	H	H	H	$-CH_3$	do.
73	do.	do.	H	H	H	$-CH_3$	do.	do.
74	do.	do.	H	H	$-CH_3$	H	do.	do.
75	do.	do.	H	H	H	—Cl	do	do.
76	do.	do.	H	H	—Cl	H	do.	do.
77	do.	do.	H	H	$-OCH_3$	H	H	do.
78	do.	do.	H	H	$-OCH_3$	H	H	do.
79	do.	do.	H	H	H	H	$-OCH_3$	do.
80	do.	do.	H	H	$-OCH_3$	H	do.	do.
81	do.	do.	H	H	H	$-OCH_3$	do.	do.
82	do.	do.	H	H	—Cl	H	H	do.
83	do.	do.	H	H	H	—Cl	H	do.
84	do	do.	H	H	H	H	—Cl	do.
85	do.	do.	H	H	—Br	H	H	do.
86	do.	do.	H	H	H	—Br	H	do.
87	do.	do.	H	H	H	H	—Br	do.

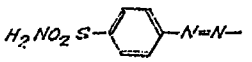
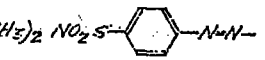
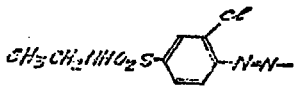
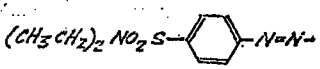
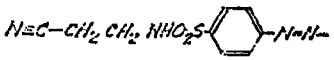
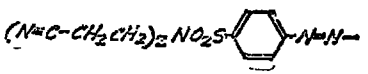
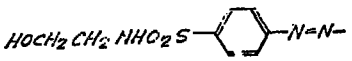
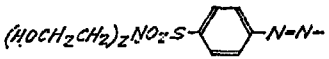
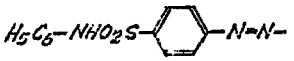
Example	X	R_1	R_2	R_3	R_4	R_5	R_6	Shade on Polyester fibre
88	$-CH_2CH_3$	$H_5C_6-N=N-$	H	H	H	H	H	reddish yellow
89	do.	do.	H	H	$-CH_3$	H	H	do.
90	$-CH_2CH_2CN$	do.	H	H	do.	H	H	do.
91	$-CH_2CH_2CH_3$	$C_6H_5N=N-$	H	H	$-CH_3$	H	H	reddish yellow
92	$-CH_2CH_3$		H	H	do.	H	H	do.
93	do.	H	H	H	H		H	yellow
94	$-CH_3$	$H_5C_6-N=N-$	$-CH_3$	H	CH_3	H	H	reddish yellow
95	do.	do.	H	$-OCH_3$	H	H	H	do.
96	do.	do.	$-Cl$	H	H	H	H	do.
97	do.	do.	$-OCH_3$	$-CCH_3$	H	H	H	do.
98	do.	do.	$-NHCOCH_3$	H	H	H	H	do.
99	do.		H	H	$-CH_3$	H	H	do.
100	do.		H	H	H	H	H	do.

			"	H	H	H	H	do.

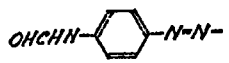
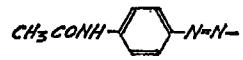
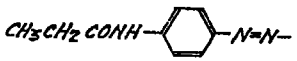
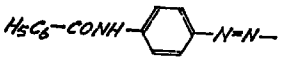
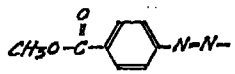
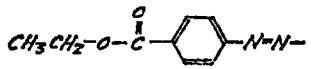
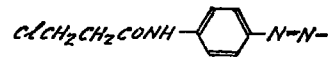
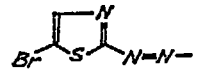
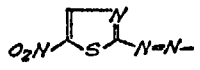
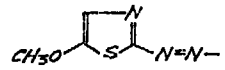
Example	X	R_1	R_2	R_3	R_4	R_5	R_6	Shade on Polyester fibre
101	$-CH_3$		H	H	$-CH_3$	H	H	reddish yellow
102	do.		H	H	do.	H	H	do.
103	$-CH_3$		H	H	$-CH_3$	H	H	do.
104	do.		H	H	do.	H	H	do.
105	do.		$-CH_3$	H	do.	H	H	do.
106	$-CH_3$		H	H	$-CH_3$	H	H	reddish yellow
107	do.	$H_5C_6-N=N-$	H	$-CH_3$	$-CH_3$	H	H	do.
108	do.	do.	H	H	H	H	H	do.
109		do.	H	H	H	H	H	do.
110		do.	H	H	H	H	H	do.
111		do.	H	H	H	H	H	do.

Example	X	R_1	R_2	R_3	R_4	R_5	R_6	Shade on Polyester fibre
112	$-CH_2CH_2COOCH_3$	$H_5C_6-N=N-$	H	H	H	H	H	reddish yellow
113	$-CH_2CH_2O.COCH_3$	do.	H	H	H	H	H	do.
114	$-CH_2CH_2OCOOCH_3$	do.	H	H	H	H	H	do.
115	$-CH_2CH_2Cl$	do.	H	H	H	H	H	do.
116	$-CH_2CH_2OCO-C_6H_5$	do	H	H	H	H	H	do.
117	$-CH_3$	—Cl	H	H	H	$-N=N-C_6H_5$	H	yellow
118	$-CH_2CH_2O.COCH_3$	H	H	H	H		H	do.
119	$-CH_3$	$H_5C_6-N=N-$	H	H	H	$-N=N-C_6H_5$	H	reddish yellow
120	$-CH_2CH_2CH_3$	do.	H	H	$-CH_3$	H	H	do.
121	$-CH_2CH_2CH_2CH_3$	do.	H	H	do.	H	H	do.

Example	X	R_1	R_2	R_3	R_4	R_5	R_6	Shade on Polyester fibre
122	$-CH_2CH_3$	$H_5C_6-N=N-$	H	H	H	H	$-CH_2CH_2$	reddish yellow
123	do.	do.	H	H	H	$-NO_2$	H	do.
124	do.	do.	H	H	H	$-CN$	H	do.
125	do.	H	Br	H	H		H	yellow
126	$-CH_2CH_2Cl$		H	H	H	$-S-C\equiv N$	H	reddish yellow
127	$-CH_2CH_2COOCH_2CH_3$		$-CH_3$	H	H	$-O-CH_2CH_2O.COCH_2CH_3$	H	do.
128	$-CH_2-C_6H_5$		$-CH_3$	$-CH_3$	$-CH_3$	H	H	do.
129	$-CH_2-CH(Cl)-CH_3$		do.	H	H	$-SO_2CH_3$	H	do.
130	$-CH_2CH_2OH$		do.	H	H	$-SO_2CH_2CH_3$	H	do.
131	$-CH_2-CH(OH)-CH_3$		do.	H	CH_3	H	H	do.

Example	X	R_1	R_2	R_3	R_4	R_5	R_6	Shade on Polyester fibre
132	$-CH_2-\underset{CN}{CH}-CH_3$		CH_3	H	CH_3	H	H	reddish yellow
133	$-CH_2CH_2O.OCH_2CH_3$		H	H	do.	$-SO_2NH_2$	H	do.
134	$-CH_2CH_2OCOOCH_2CH_3$		H	H	do.	H	H	do.
135	$-CH_2CH_2CONH_2$		H	H	do.	H	H	do.
136	$-CH_2CH_2OCOOCH_2C_6H_5$		H	H	do.	H	H	do.
137	$-CH_2CH_2OCH_3$		H	H	do.	$-CH_3$	H	do.
138	$-CH_2CH_2OCH_2CH_3$		H	H	do.	H	H	do.
139	$-CH_2CH_2-O-C_6H_5$		H	H	do.	H	H	do.
140	$-CH_2-\underset{CH_3}{CH}-O-CH_3$		H	H	do.	H	$-CH_3$	do.
141	$-CH_2-\underset{CH_3}{CH}-O-CH_2CH_3$		H	H	do.	H	H	do.

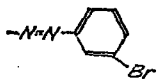
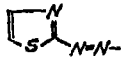
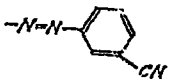
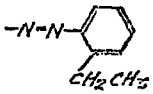
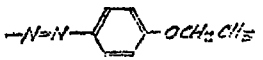
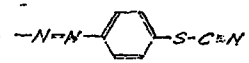
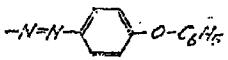
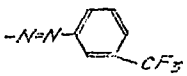
141	$-CH_2-CH-O-CH_2CH_3$		H	H	do.	H	H	do.

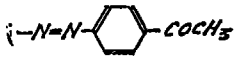
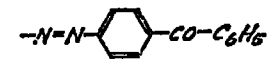
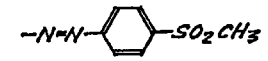
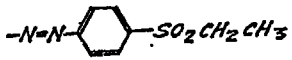
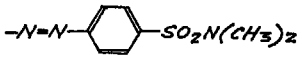
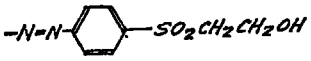
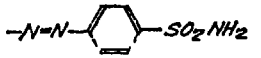
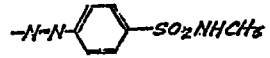
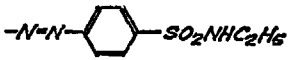
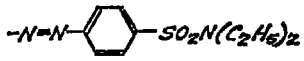
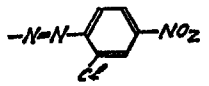
Example	X	R_1	R_2	R_3	R_4	R_5	R_6	Shade on Polyester fibre
142	$-CH_2CH_3$		H	H	CH_3	H	H	reddish yellow
143	$-CH_2CH_3$		H	H	CH_3	H	H	do.
144	$-CH_2-CH_2-CH_3$		H	H	do.	H	H	do.
145	$-CH_2CH_2O.COCH_3$		H	H	H	$-SO_2CH_2-C_6H_5$	H	do.
146	$-CH_2CH_3$		$-NHCOC_2H_5$	H	CH_3	H	H	orange
147	$-CH_3$		H	H	do.	H	H	reddish yellow
148	$-CH_2CH_3$		H	H	do.	H	H	do.
149	$-CH_2CH_2O.CON(CH_3)_2$		H	H	do.	H	H	do.
150	$-CH_2CONH_2$		H	H	do.	H	H	do.
151	$-CH_2CH_3$		H	H	do.	H	H	do.

Example	X	R_1	R_2	R_3	R_4	R_5	R_6	Shade on Polyester fibre
152	$-CH_2CH_3$		H	H	H	H	$-OCH_3$	reddish yellow
153	$-CH_2CH_2O.CONH-C_6H_5$		H	H	CH_3	H	H	do.
154	$-CH_2CH_3$		H	H	do.	H	H	do.
155	$-CH_2CH_3$		H	H	do.	H	H	do.
156	$-CH_2CH_2O.COCH_3$		H	H	H	Cl	H	do.
157	$-CH_2CH_2CONH_2$		H	H	H	H	$-OCH_3$	do.

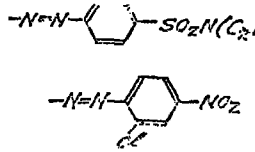
Example	X	R_1	R_2	R_3	R_4	R_5	R_6	Shade on Polyester fibre
158	$-CH_2CH_3$		H	H	H	$-SO_2NHCH_3$	H	reddish yellow
159	do.		H	H	H	$-CH_3$	$-CH_3$	do.
160	do.		H	H	H	$-SO_2NHCH_2CH_3$	H	do.
161	do.		H	H	H	$-SO_2NHCH_2CH_2CH_2OCH_3$	H	do.
162	do.		H	H	H	$-SO_2N(CH_3)_2$	H	do.
163	do.		H	H	H	$-SO_2N(CH_2CH_3)_2$	H	do.

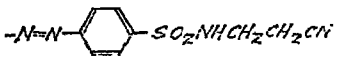
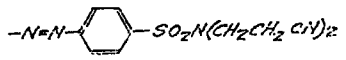
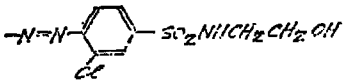
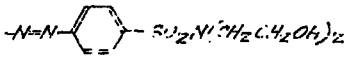
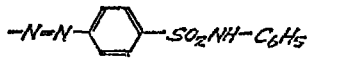
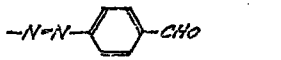
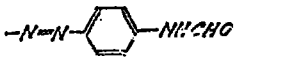
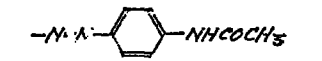
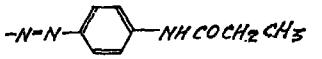
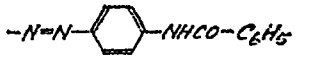
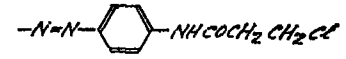
Example	X	R_1	R_2	R_3	R_4	R_5	R_6	Shade on Polyester fibre
164	$-CH_2CF_3$		H	H	CH_3	H	H	reddish yellow
165	do.		H	H	do.	H	H	do.
166	do.		H	H	do.	H	H	do.
167	do.		H	H	do.	H	H	do.
168	do.		H	H	do.	H	H	do.

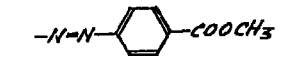
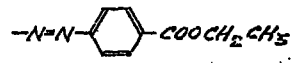
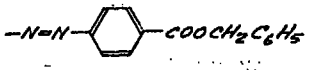
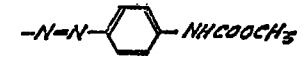
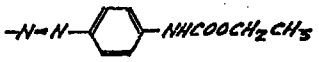
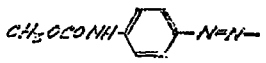
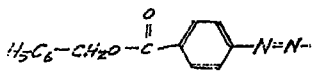
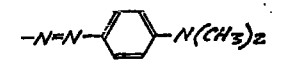
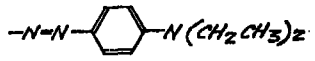
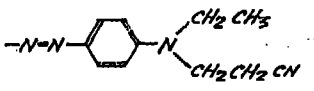
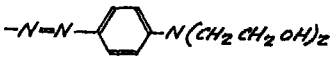
Example	X	R_1	R_2	R_3	R_4	R_5	R_6	Shade on Polyester fibre
169	H	—Cl	H	H	$—CH_3$		H	reddish yellow
170	$—CH_3$		H	H	do.	H	H	do.
171	$—CH_2CH_3$	—Br	H	H	—NHCHO		H	do
172	do.	H	H	H	$—NHCO—C_6H_5$		H	do.
173	do.	$—NHCO—C_6H_5$	H	H	$—CH_3$		H	do.
174	do.	$—NHCOOCH_3$	H	H	do.		H	do.
175	$—CH_2CH_2OCH_3$	H	$—CH_3$	H	do.		H	do.
176	$—CH_2CH_2O.COCH_3$	H	do.	H	do.		H	do.

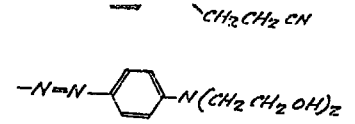
Example	X	R_1	R_2	R_3	R_4	R_5	R_6	Shade on Polyester fibre
177	$-CH_2CH_2O.COCH_3$	H	—Cl	H	$-CH_3$		H	yellow
178	$-CH_2CH_3$	$-NHCOOCH_2CH_3$	H	H	do.		H	do.
179	do.	$-NHCOOCH_2-C_6H_5$	H	H	do.		H	do.
180	do.	$-NHCOCH_2CH_2Cl$	H	H	do.		H	do.
181	do.	H	Br	H	do.		H	do.
182	do.	Br	H	H	do.		H	do.
183	do.	Cl	H	H	do.		H	do.
184	do.	H	Cl	H	H		H	do.
185	do.	H	H	H	H		H	do.
186	do.	H	H	H	H		H	do.
187	do.	H	CH_3	H	$-CH_3$			

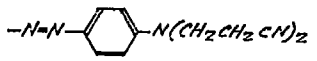
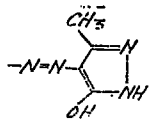
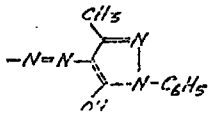
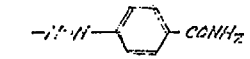
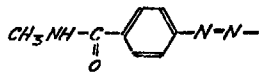
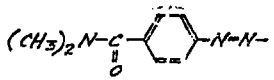
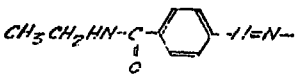
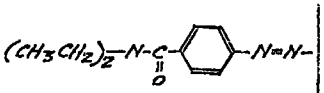
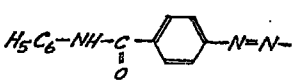
Example	X	R_1	R_2	R_3	R_4	R_5	R_6	Shade on

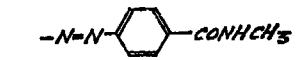
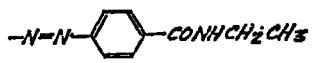
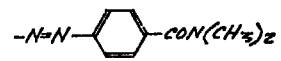
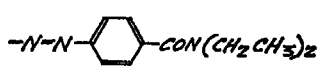
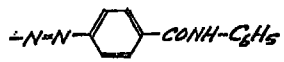
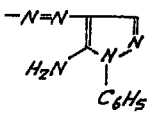
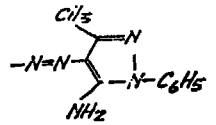
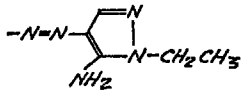
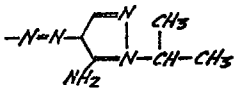
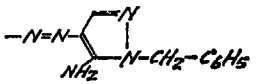
187	do.	H	CH_3	H	$-CH_3$		H	do.

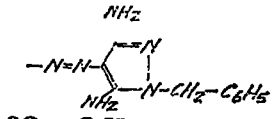
Example	X	R_1	R_2	R_3	R_4	R_5	R_6	Colour of dyeing on wool
188	$-CH_2CH_3$	H	H	H	H		H	yellow
189	do.	H	$-CH_3$	H	$-CH_3$		H	do.
190	do.	H	H	H	do.		H	reddish yellow
191	H	H	H	H	do.		H	yellow
192	H	H	H	H	do.		H	do.
193	$-CH_3$	H	H	H	do.		H	do.
194	$-CH_2CH_3$	H	H	H	H		$-OCH_3$	do.
195	$-CH_2CH_2O.COCH_3$	H	H	H	$-CH_3$		H	do.
196	$-CH_2CH_2O.COCH_2CH_3$	H	H	H	do.		H	do.
197	$-CH_2CH_2O.CO-C_6H_5$	H	H	H	do.		H	do.
198	$-CH_2CH_3$	H	H	H	do.		H	do.

Example	X	R_1	R_2	R_3	R_4	R_5	R_6	Shade on Polyester fibre
199	$-CH_2CH_3$	H	H	H	H		H	yellow
200	H	H	H	H	$-CH_3$		H	do.
201	$-CH_2CH_3$	H	H	H	do.		H	do.
202	do.	H	$-CH_3$	H	do.		H	do.
203	do.	H	H	H	do.		H	do.
204	do.		H	H	do.	H	H	reddish yellow
205	H		H	H	do.	H	H	do.
206	H	Cl	H	H	H		H	
207	H	H	Cl	H	H		H	do.
208	H	Br	H	H	H		H	do.
209	H	H	H	H	H		H	do.

209	H	H	H	H	H		H	do.

Example	X	R_1	R_2	R_3	R_4	R_5	R_6	Shade on Polyester fibre
210	H	Cl	$-CH_3$	H	H		H	yellow
211	H	Cl	H	H	H		H	do.
212	H	Cl	H	H	H		H	do.
213	$-CH_2CH_3$	H	H	H	$-CH_3$		H	do.
214	do.		H	H	do.	H	H	reddish yellow
215	do.		H	H	do.	H	H	do.
216	do.		$-CH_3$	H	do.	H	H	do.
217	do.		H	H	do.	H	H	do.
218	do.		$-CH_3$	H	do.	H	H	do.

Example	X	R_1	R_2	R_3	R_4	R_5	R_6	Shade on Polyester fibre
219	$-CH_3$	H	H	H	do.		H	yellow
220	H	H	H	H	do.		H	do.
221	H	H	H	H	$-CH_3$		H	yellow
222	H	H	H	H	do.		H	do.
223	H	H	—Cl	H	do.		H	do.
224	H	Cl	H	H	H		H	do.
225	H	H	H	H	H		H	do.
226	H	H	Cl	H	H		H	do.
227	H	H	H	H	H		H	do.
228	H	H	Cl	H	H		H	do.
229	$-CH_2CH_3$	$H_5C_6-N=N-$	H	H	H	$-SO_2-C_6H_5$	H	reddish yellow

228	H	H	Cl	H	H		H	do.
229	$-CH_2CH_3$	$H_5C_6-N=N-$	H	H	H	$-SO_2-C_6H_5$	H	reddish yellow

Example	X	R_1	R_2	R_3	R_4	R_5	R_6	Shade on Polyester fibre
230	$-CH_2CH_3$	$H_5C_6-N=N-$	H	H	H	$-SO_2N(CH_3)_2$	H	reddish yellow
231	do.	do.	$-CH_3$	H	H	$-SO_2N(CH_2CH_3)_2$	H	do.
232	do.	do.	do.	H	H	$-COCH_3$	H	do.
233	$-CH_3$	do.	do.	H	H	$-CO-C_6H_5$	H	do.
234	do.	do.	do.	H	H	$-CONH_2$	H	do.
235	do.	do.	do.	H	H	$-CONHCH_3$	H	do.
236	$-CH_2CH_3$	do.	H	H	H	$-CON(CH_3)_2$	H	do.
237	do.	do.	H	H	H	$-CONHCH_2CH_3$	H	do.
238	do.	do.	H	H	H	$-CON(CH_2CH_3)_2$	H	do.
239	$-CH_2CH_2CH_3$	do.	H	H	H	$-CONHCH_2CH_2CH_2OCH_3$	H	do.

The dyes defined in the following Table III conform to the general formula

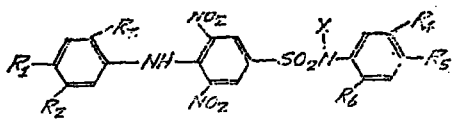
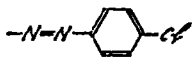
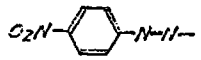
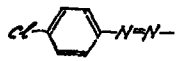
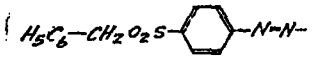
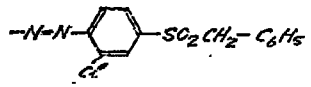
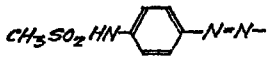
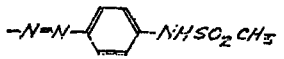
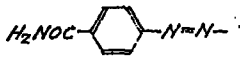


TABLE III

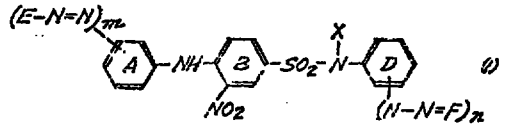
Example	X	R_1	R_2	R_3	R_4	R_5	R_6	Shade on Polyester fibre
240	$-CH_2CH_3$	$H_5C_6-N=N-$	H	H	H	H	H	reddish yellow
241	do.	do.	$-CH_3$	H	CH_3	H	H	do.
242	do.	do.	H	H	H	$-OCH_3$	$-OCH_3$	do.
243	H	do.	H	H	H	H	H	do.
244	H	Cl	H	H	H	$-N=N-C_6H_5$	H	yellow
245	$-CH_2CH_3$	Br	H	H	$-CH_3$	do.	H	do.
246	do.	H	Br	H	do.	do.	H	do.
247	do.	H	Cl	H	H		H	do.
248	do.	$H_5C_6-N=N-$	H	$-OCH_3$	$-CH_3$	H	H	reddish yellow
249	$-CH_2CH_2OCOCH_3$	do.	H	H	H	H	H	do.
250	H	do.	H	H	$-OCH_2$	H	H	do.
251	H	do.	H	H	H	H	$-OCH_3$	do.
252	$-CH_2CH_3$		H	H	$-CH_3$	H	H	do.
253	do.	do.	H	H	H	$-OCH_2CH_2O.COCH_3$	H	do.

253	do.	do.	H	H	H	$-OCH_2CH_2O.COCH_3$	H	do.

Example	X	R_1	R_2	R_3	R_4	R_5	R_6	Shade on Polyester fibre
254	$-CH_2CH_2CN$		$-CH_3$	H	$-CH_3$	H	H	reddish yellow
255	$-CH_2CH_3$		H	H	do.	H	H	do.
256	do.	H	H	H	H		H	do.
257	do.		H	H	CH_3	H	H	do.
258	do.	H	H	H	H		H	yellow
259	do.		H	H	$-CH_3$	H	H	reddish yellow

WHAT WE CLAIM IS:—

1. Azo compounds of formula



(I)

where E stands for a phenyl radical which may be substituted by one or more chlorine or bromine atom, lower alkyl, lower alkoxy, trifluoromethyl, nitro, cyano, thiocyanato, phenoxy, formyl, acetyl, benzoyl, lower alkylsulphonyl, lower hydroxyalkylsulphonyl, benzylsulphonyl, aminosulphonyl, methylaminosulphonyl, cyanoethylaminosulphonyl, hydroxyethylaminosulphonyl, phenylaminosulphonyl, formylamino, lower alkanoylamino, chloropropionylamino, lower alkylsulphonylamino, lower alkoxycarbonyl, benzyloxycarbonyl, lower alkoxycarbonylamino, aminocarbonyl, lower alkylaminocarbonyl or phenylaminocarbonyl groups; for a naphthalene radical which may be substituted by a methylsulphonyl group; for a thiazole radical which may be substituted by one or more chlorine or bromine atoms, methyl, methoxy, nitro, methylsulphonyl or trifluoromethyl groups; for a benzothiazole radical which may be substituted by one or more chlorine or bromine atoms, or a nitro, cyano, methylsulphonyl, methoxy, trifluoromethyl, aminosulphonyl, lower alkylaminosulphonyl, hydroxyethylaminosulphonyl or methoxypropylaminosulphonyl group; for a pyrazole radical which may be substituted by one or more methyl, benzyl or phenyl groups; for a 4-aminocarbonylimidazole radical; for a 4 - phenylthiadiazole - (1,3,5) - radical; for a thiophene radical; for a quinoline radical or for a tetrazole radical,

F for a phenyl, naphthyl, thiazolyl, benzothiazolyl, pyrazolyl, imidazolyl, thiadiazolyl, trienyl, quinolyl, tetrazolyl or acetoacetic acid anilide radical which may be substituted;

X for a hydrogen atom or an optionally substituted alkyl group;

m for 0 or 1 and

n for 0 or 1,

where the sum of m and n is at least 1, and where the rings A, B and D may each bear one or more further substituents and the molecule is free from sulphonic acid groups.

2. Azo compounds according to claim 1 where F stands for a phenyl radical which may be substituted by one or more chlorine or bromine atoms, lower alkyl, lower alkoxy, phenoxy, trifluoromethyl, thiocyanato, cyano, nitro, hydroxyl, formyl, acetyl, benzoyl, lower alkylsulphonyl, hydroxyethylsulphonyl, benzylsulphonyl, aminosulphonyl, lower alkylaminosulphonyl, cyanoethylaminosulphonyl, hydroxyethylaminosulphonyl, phenylaminosulphonyl, lower alkylamino, cyanoethylamino, formylamino, lower alkanoylamino, chloropropionylamino, methylsulphonylamino, lower alkoxycarbonyl, benzyloxycarbonyl, lower alkoxycarbonylamino, aminocarbonyl, lower alkylaminocarbonyl or phenylaminocarbonyl groups; for a naphthalene radical which may be substituted by a methylsulphonyl group; for a benzothiazole radical which may be substituted by one or more chlorine or bromine atoms or a nitro, cyano, methylsulphonyl, methoxy, trifluoromethyl, aminosulphonyl, methylaminosulphonyl, ethylaminosulphonyl, hydroxyethylaminosulphonyl or methoxypropylaminosulphonyl group; for a pyrazole radical which may be substituted by one or more lower alkyl, hydroxyl, amino, carboxylic acid amide or phenyl groups; for a 4-aminocarbonylimidazole radical; for a 4 - phenylthiadiazole - (1,3,5) - radical; for a thiophene radical; for a quinoline radical; for a hydroxyquinoline radical; for a tetrazole radical or for an acetoacetic acid anilide radical;

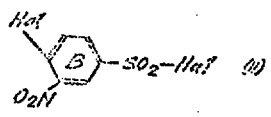
X for a hydrogen atom or a lower alkyl group which may be substituted by one or more chlorine or bromine atoms, hydroxyl, cyano, lower alkanoyloxy, benzoyloxy, lower alkoxycarbonyloxy, lower alkoxycarbonyl, aminocarbonyl, benzyloxycarbonyloxy, lower alkoxy, phenoxy, pyridyl, aminocarbonyl, dimethylaminocarbonyloxy or phenylaminocarbonyloxy groups,

and where the ring A may bear as substituents one or more chlorine or bromine atoms, lower alkyl, lower alkoxy, formylamino, lower alkanoylamino, benzoylamino, lower alkoxycarbonylamino, benzyloxycarbonylamino or chloropropionylamino groups, the ring B may bear a further nitro group; and the ring D may bear one or more chlorine or bromine atoms, lower alkyl, lower alkoxy, phenoxy, hydroxyl, cyano, nitro, thiocyanato, hydroxyethoxy, lower alkanoyloxyethoxy, formylamino, lower alkanoylamino, benzoylamino, lower alkylsulphonyl, benzylsulphonyl, phenylsulphonyl, aminosulphonyl, lower alkylaminosulphonyl, acetyl, benzoyl, aminocarbonyl, lower alkylaminocarbonyl, methoxypropylaminocarbonyl groups or, in the 3,4-positions, a group of formula

$$—CH_2—O—CH_2—O—.$$

3. The particular azo compounds according to claim 1 herein described and exemplified.

4. A process for the production of an azo compound according to Claim 1, which comprises condensation of 1 mole of a compound of formula

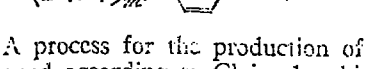


(II)

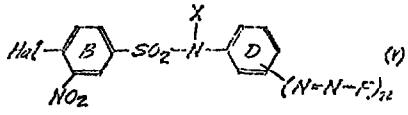
where Hal represents a chlorine or bromine atom, with 1 mole of an amine of formula



and 1 mole of an amine of formula

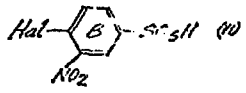


5. A process for the production of an azo compound according to Claim 1, which comprises melting 1 mole of a compound of formula

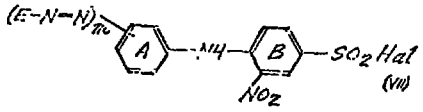


where Hal represents a chlorine or bromine atom, and 1 mole of an amine of formula (IV) and condensing in the melt at a temperature in the range of 100° to 220°C and in the presence of an acid-binding agent.

6. A process for the production of an azo compound according to Claim 1, which comprises condensing 1 mole of a compound of formula

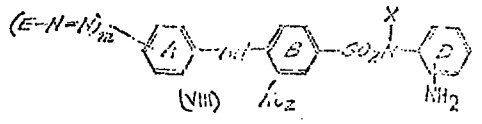


where Hal represents a chlorine or bromine atom, with 1 mole of an amine of formula (IV), converting the resulting compound with a halogenating agent into the sulphonic acid chloride or bromide of formula



and condensing this with 1 mole of an amine of formula (III).

7. A process for the production of an azo compound according to Claim 1, which comprises diazotising 1 mole of a compound of formula



and coupling with 1 mole of a compound of formula

H—H (IX).

8. A process for the production of an azo compound according to claim 1 substantially as herein described and exemplified.

9. Azo compounds according to claim 1 whenever prepared by a process according to any one of claims 4 to 8.

10. A dyeing or printing process in which fibres consisting of synthetic or semi-synthetic hydrophobic, high molecular organic substances, or textile materials made therefrom, are dyed or printed with an azo compound according to any one of Claims 1 to 3 or 9.

11. A dyeing process conducted substantially as described in any of Dyeing Examples 1 to 6.

12. Fibres consisting of synthetic or semi-synthetic hydrophobic, high molecular organic substances, and textile materials made therefrom, dyed or printed with an azo compound according to any one of claims 1 to 3 or 9.

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Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1972.
Published by the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.

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