United States Patent

[11] 3,615,547

[72] Inventors **Hiroyuki Amano; Fumihiko Nishio; Nobuo Tsuji; Kazuo Shirasu, all of Kanagawa, Japan**

[21] Appl. No. **720,344**
[22] Filed **Apr. 10, 1968**
[45] Patented **Oct. 26, 1971**
[73] Assignee **Fuji Shashin Film Kabushiki Kaisha (now Fuji Photo Film Co., Ltd.) Kamigun, Kanagawa, Japan**
[32] Priority **Apr. 10, 1967**
[33] **Japan**
[31] **42/22756**

---

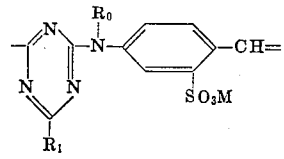
[54] **PHOTOGRAPHIC LIGHT SENSITIVE ELEMENTS, CONTAINING ULTRAVIOLET MATERIALS**
11 Claims, No Drawings

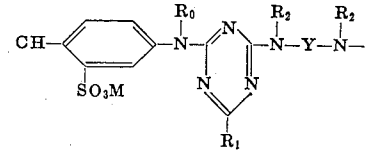
[52] **U.S. Cl.** **96/84,** 96/85
[51] **Int. Cl.** **G03c 1/84**
[50] **Field of Search** 96/84, 85

[56] **References Cited**
UNITED STATES PATENTS
2,933,390 4/1960 McFall et al. 96/84

Primary Examiner—Norman G. Torchin
Assistant Examiner—Edward C. Kimlin
Attorney—Sughrue, Rothwell, Mion, Zinn & MacPeak

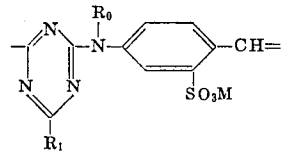
ABSTRACT: A photographic light-sensitive element containing an ultraviolet absorbent material which has improved resistance to ultraviolet rays, staining and an improved whitening effect, contains a high molecular weight compound having a repeating unit represented by one of the general formulas set out below:

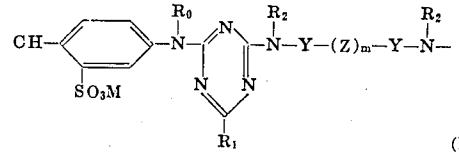




(I)

for





(II)

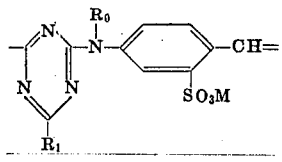
in at least one photographic emulsion layer, intermediate layer, protective layer, subbing layer, backing layer, or a baryta layer. The representative letters such as R_0, M and the like are explicitly defined in the specification.

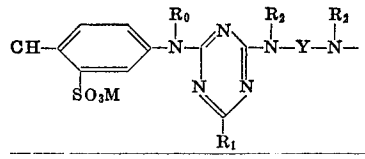
PHOTOGRAPHIC LIGHT SENSITIVE ELEMENTS, CONTAINING ULTRAVIOLET MATERIALS

Summary of the Invention

By incorporating a high molecular weight ultraviolet absorber, having a repeating unit represented by formula(1) or (2) shown below in at least one of the photographic emulsion layers, intermediate layers, protective layers, undercoats or backing layers of a photographic-sensitive element, excellent ultraviolet inhibiting effects and stain prevention can be obtained. In addition, the whiteness of the photographic material will be retained even after repeated photographic processing and washing steps.

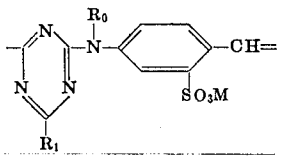
General formulas (1) and (2) may be represented as follows:

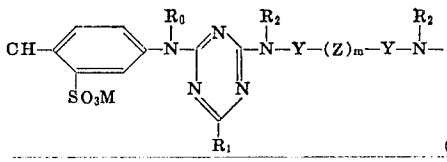




(I)

for





(II)

The moieties represented by the figure such as R_0, M and the like are explicitly defined under the heading "Description of the Preferred Embodiments."

Background of the Invention

1. Field of the Invention

The present invention relates to a photographic light-sensitive element containing an ultraviolet absorbent and, more particularly, to a photographic light-sensitive element having improved resistance to ultraviolet rays, resistance to staining, and an improved fluorescent-whitening effect.

2. Description of the Prior Art

In general, when a color photographic image obtained by color development is irradiated with ultraviolet light, the color image will fade or discolor proportionately to the intensity and the wave length of the ultraviolet light.

Furthermore, it is known that where materials other than those composing the color image, such as a coupler, remain in a photographic emulsion layer after the formation of the color image by processing, the material is attacked by ultraviolet light and forms undesirable stains in the photographic emulsion layer. Such an attack is caused mainly by ultraviolet light having a wave length of from 300 to 400 m. μ.

To prevent the formation of stains, it is known to incorporate an ultraviolet inhibitor in photographic emulsion layers, intermediate layers, protective layers, undercoats, or backing layers. However, many of the conventional ultraviolet inhibitors have faults, i.e. the ultraviolet inhibitor itself is photodegraded by ultraviolet light to form undesirable stains. In addition, the greater part of the ultraviolet inhibitor thus incorporated is dissolved out of the emulsion layer by photographic processing or washing, thereby resulting in a reduction or weakening of the ultraviolet inhibitor.

To improve the whiteness of photographic printing papers, it is known to incorporate a fluorescent whitening agent which emits purple to blue fluorescence under ultraviolet radiation in a photographic emulsion layer (including incorporation in a positive layer for a printing paper utilized in a diffusion transfer reversal method) or in subsidiary layers, such as an undercoat, a protective layer or the baryta layer of a baryta-coated paper.

However, since commercially available fluorescent whitening agents are usually low molecular weight compounds, they have inherent faults. Often, the dying power of conventional fluorescent whitening agents with gelatin is very weak, and when they are incorporated into photographic gelatino-emulsion layers or subsidiary gelatin layers, the greater part of the fluorescent whitening agent will be dissolved out of the layers during photographic processing or water washing. This will, of course, reduce the whitening effect of these materials.

Various solutions have been proposed for overcoming the above-mentioned drawbacks. For example, a method has been proposed in which a substituent capable of giving good dyeing capabilities to gelatin is introduced into a fluorescent whitening agent, and methods have been proposed in which polyvinyl pyrrolidone (Japanese Publication No. 7127/59) or poly-N-vinyl-5-methyl-2-oxazolidinone (Japanese Patent Publication No. 22065/64), both of which have good dyeing capabilities, are dispersed in gelatin. However, the dissolution of fluorescent whitening agent cannot be sufficiently prevented by these methods, and the whiteness of the printing paper containing the whitening agent is nonetheless reduced during photographic processing or water washing.

Therefore, an object of the present invention is to provide a photographic light sensitive element which illustrates an improved ultraviolet inhibiting effect and an improved stain preventing effect without the aforesaid faults.

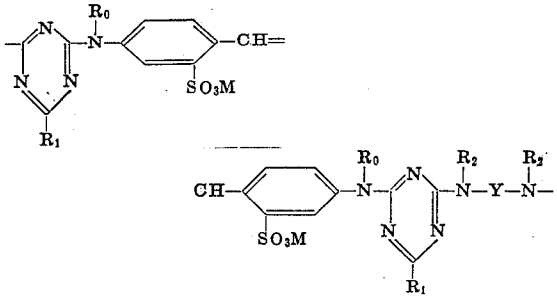
A further object of this invention is to provide a photographic light sensitive element which contains an improved fluorescent whitening agent and which has an excellent whitening effect without the conventional faults heretofore described.

It has been discovered that by incorporating a high molecular weight ultraviolet absorber, having a repeating unit represented by general formulas (1) or (2) shown below, in at least one of the photographic emulsion layers, intermediate layers, protective layers, undercoat, or backing layer of a photographic light sensitive element, that an excellent ultraviolet inhibiting effect and stain preventing effect can be obtained. It has been found that even if an ultraviolet inhibitor having a repeating unit of formula (1) or (2) causes photodegradation under ultraviolet light of high intensity, no undesirable stains remain.

In addition, it has been found that a photographic printing paper containing a high molecular weight compound having a repeating unit of general formula (1) or (2) in the photographic emulsion layers, an intermediate layer, a protective layer, a baryta layer or a backing layer of the printing paper, will have excellent whiteness even after photographic processing and washing.

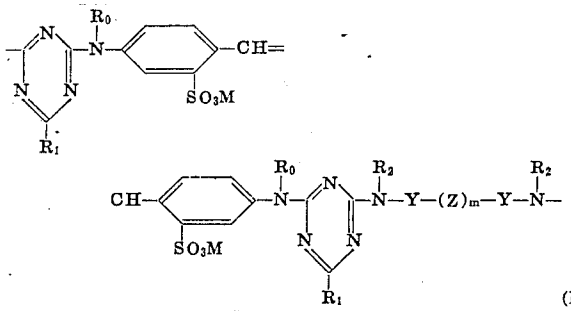
Thus, a photographic light sensitive element produced in accordance with the present invention has at least one photo-

graphic emulsion layer, intermediate layer, a protective layer, subbing layer, backing layer or baryta layer which has incorporated therein a high molecular weight compound having a repeating unit represented by general formula (1) or (2), which are as follows:



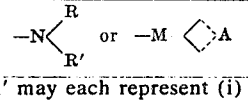
(I)

for



(II)

R_0 and R_2 may each represent a hydrogen atom, an alkyl group having from 1–8 carbon atoms, an aryl group having from 6–12 carbon atoms, a hydroxyalkyl group having from 2–4 carbon atoms or such a group which is substituted, a sulfoalkyl group having from 1–4 carbon atoms, or an alkali metal or an ammonium salt thereof; R_1 may represent a halogen atom — OR, —SR,

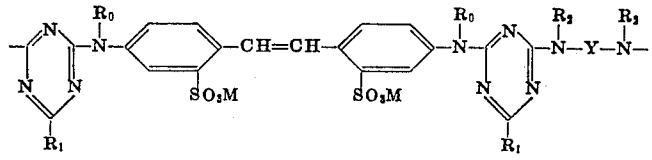


wherein R and R′ may each represent (i) a hydrogen atom, (ii) an alkyl group having from 1–12 carbon atoms, a hydroxyalkyl group, a sulfo-alkyl group, an alkali salt of a sulfoalkyl group or an ammonium salt thereof a carboxyalkyl group, an alkali salt of a carboxyalkyl group, an ammonium salt of a carboxyalkyl group, or an aralkyl group, (iii) an aryl group having from 6–18 carbon atoms, a hydroxy, carboxy or sulfonic acid derivative of said aryl group, an alkali metal or ammonium salt of said aryl group, (vi) a cycloaklyl group having from 6–10 carbon atoms, a substituted cycloalkyl group having from 6–10 carbon atoms; A represents an alkylene group having from 4–5 carbon atoms or an alkylene group having from 4–5 carbon atoms or an alkylene group having from 6–10 carbon atoms with a heteroatom or a heteroatomic group; Y represents an alkylene group having from 2–10 carbon atoms or a substituted alkylene group having from 2–10 carbon atoms; an arylene group having from 6–18 carbon atoms or a substituted arylene group having from 6–18 carbon atoms; Z represents a divalent hetero atom or a divalent hetero atomic group; *m* is 0 or 1; and M represents an alkali metal or NH_4.

A high molecular weight compound having a repeating unit represented by general formula (1) or (2) which may be used in this invention, has an excellent ultraviolet inhibiting effect, stain preventing effect and whitening effect.

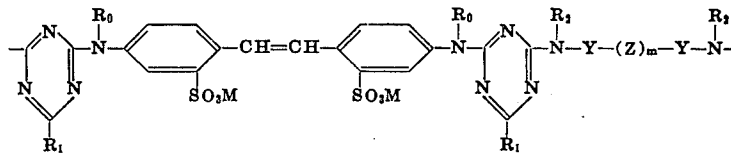
The above described high molecular weight compound which is used in the invention is a compound which has S-triazine rings and diaminostilbene sulfonate residual groups, and it may be prepared by the following method using the raw materials set out below.

The high molecular weight compound may be prepared by dissolving or dispersing in a solvent, such as water or dimethylformamide, one mol of an S-triazine-stilbene derivative which has the general formula:



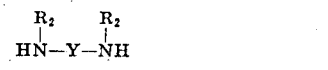
(I)

for



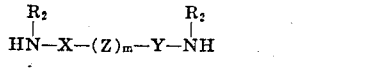
(II)

(wherein X represents a halogen atom or an alkoxy group having from 1–4 carbon atoms, and R_0, R_1 and M have the same formulas as indicated under the general explanation of their form in formulas (1) or (2),) and about one mol of a diamino compound represented by formula (4) or (5) as follows:



(IV)

or

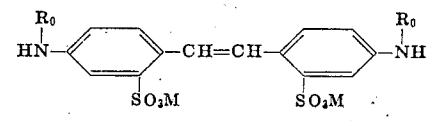


(V)

wherein R_2, Y, Z and m have the same meaning as indicated in the explanation of general formulas (1) or (2). These components are reacted at a temperature of from about 50 to 150° C. with the addition of from 2–2.4 mols of an aqueous sodium hydroxide solution. In addition, the high molecular weight compounds of this invention may be prepared by any other standard methods.

The bis-S-triazine-stilbene derivative described by general formula (III) may be prepared by conventional methods as shown in "The Journal of the SOciety of Organic Chemistry, Japan," VOl. 20, 64 (1062).

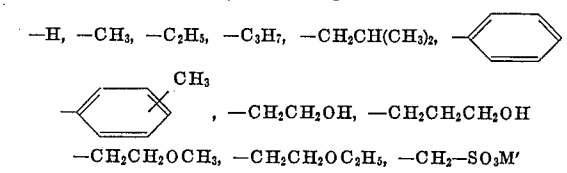
FOr example, the derivative may be M have by reacting 2 mols of cyanuric chloride with 1) mol of a derivative of 4,4′-diaminostilbene-2,2′-disulfonate represented by the general formula:



(wherein R_0 and M have the same meanings as in general formula (1) or (2) at a temperature of about −5° C. to 10° C. The compound thus obtained is reacted with 2 mols of a nucleophilic agent illustrated by the formula HR_1 (wherein R_1 is the same as in general formula (1) or (2)) at a temperature of from 0° to about 20° C.

Some examples of R_0, R_1, R_2, Y, and Z in the repeating unit (1) or (2) of the high molecular weight compounds of this invention are as follows:

R_0 and R_2 may be, for example:

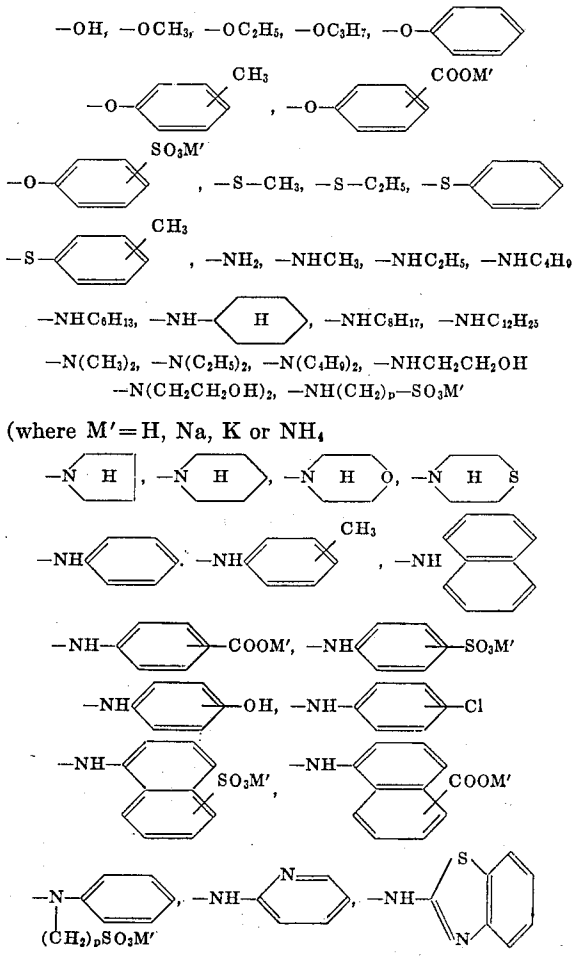


(where M′ represents H, Na, K or NH_4),

$-(CH_2)3-SO_3M'$, $-(CH_2)_4SO_3M'$

and the like.

Some examples of R_1 are:

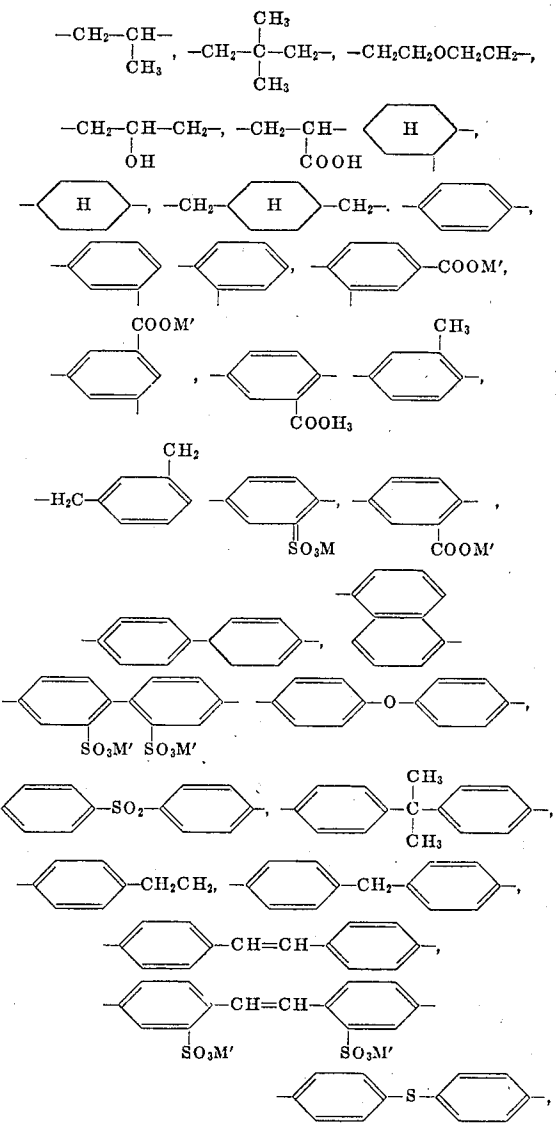


(where M′=H, Na, K or NH_4

(where M′=H, Na, K or NH_4 and P=1, 2, 3 or 4).

Examples of Y are;

$-(CH_2)_q-$(q may vary from 2-10),

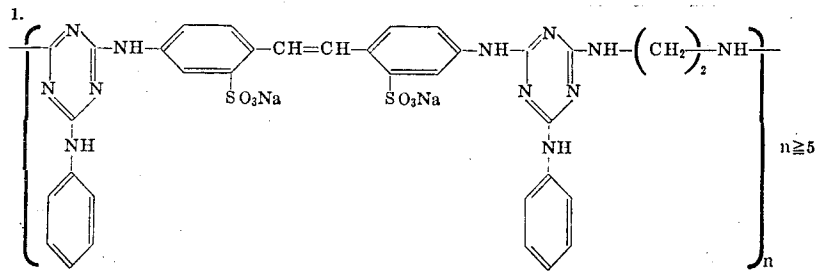


(where M′=H, Na, K or NH_4).

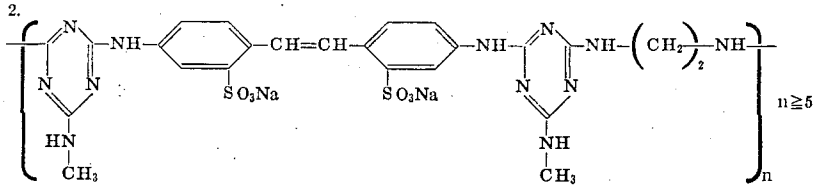
Examples of Z are: O, S and SO_2.

Typical examples of compounds included in the general formula (1) or (2) which may be used in this invention are as follows:

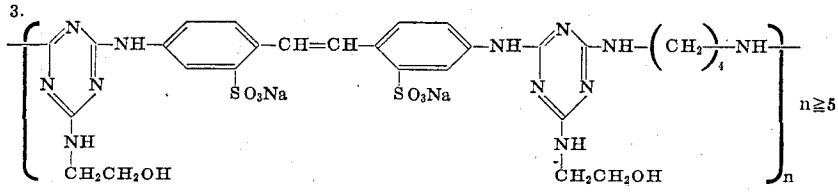
1.



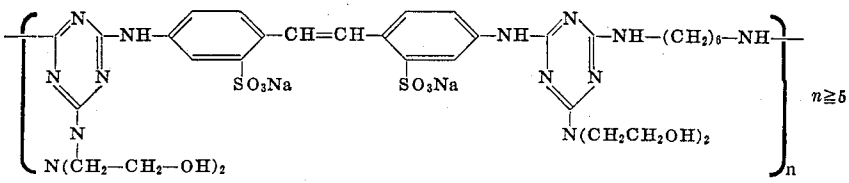
2.



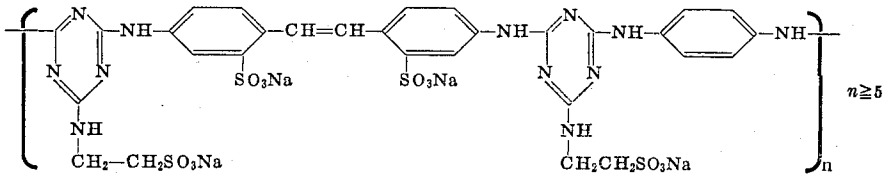
3.



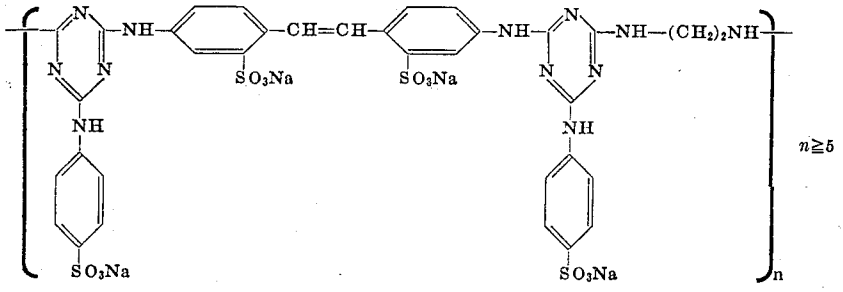
4.



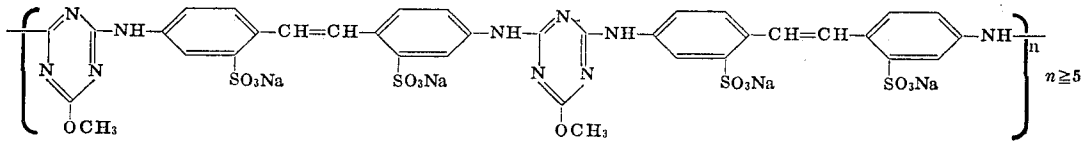
5.



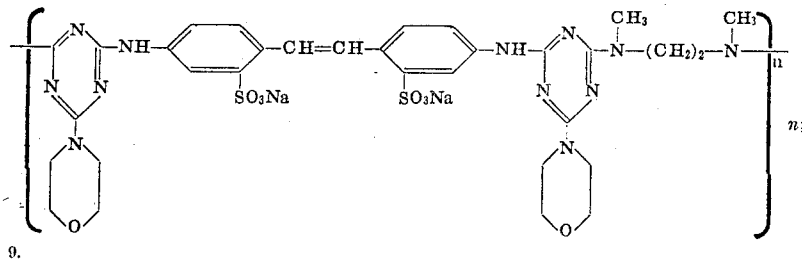
6.



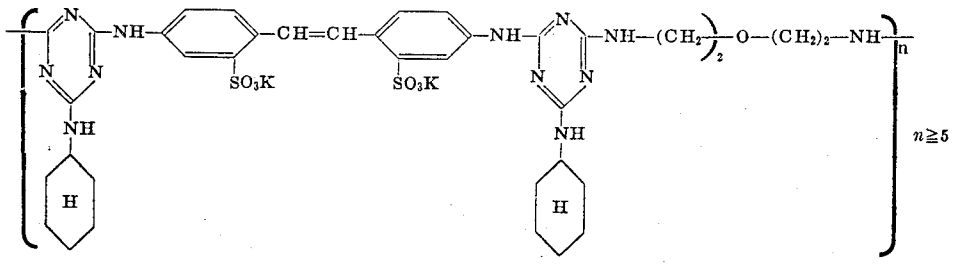
7.



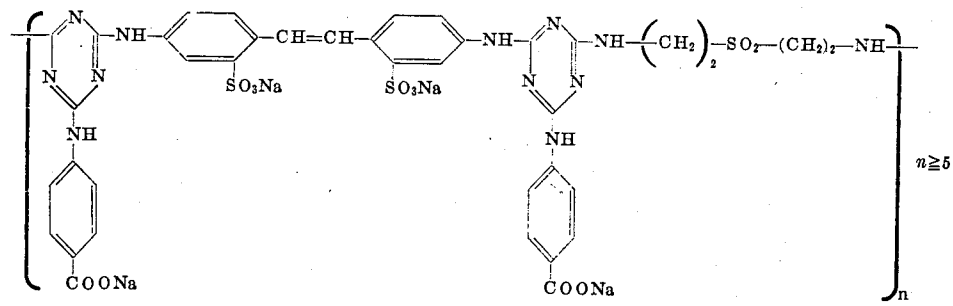
8.



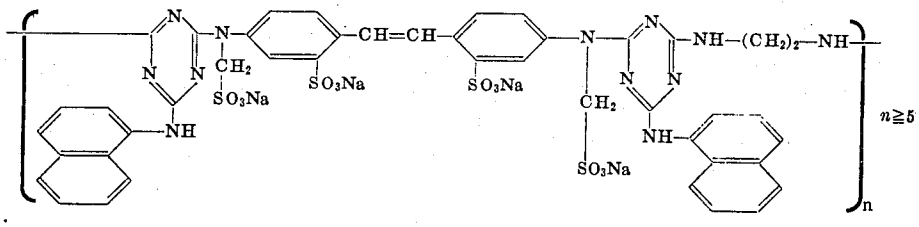
9.



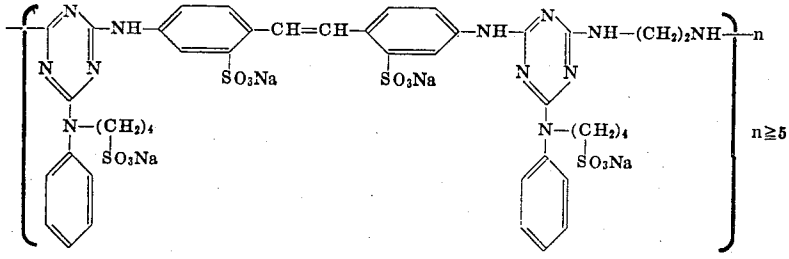
10.



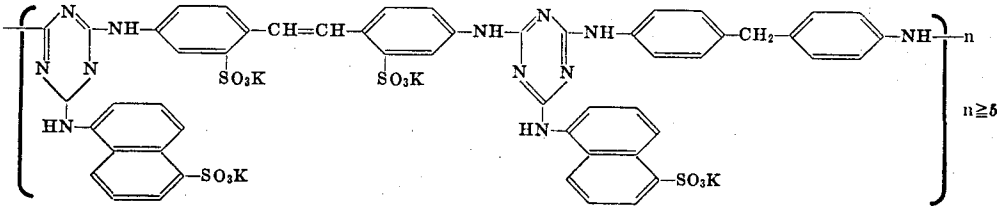
11.



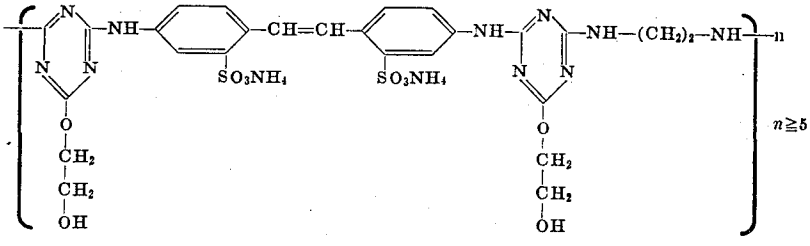
12.



13.



14.



These compounds may generally be prepared by the methods described above, but an example will be given in detail for Compound 1.

A solution of 14.7 parts by weight of cyanuric chloride in 80 parts of acetone is dispersed in a slurry of 240 parts by weight of ice water, and the dispersion is maintained at about 0–3° C. To the dispersion there is added dropwise 16.5 parts of sodium 4,4′ diaminostilbene-2,2′-disulfonate as a 10% aqueous solution. During the addition, hydrochloric acid is formed in the system, and an aqueous solution of sodium carbonate is added dropwise (4.2 parts by weight sodium carbonate and 50 parts by weight water) so that the pH of the system is in the range of 4–5. The system is, thereafter, stirred for about 30 minutes at about 0–5° C., and 7.5 parts of aniline is further added to the reaction mixture. Thereafter, the temperature of the system is increased to 20° C. and an aqueous solution of sodium carbonate (4.2 parts by weight sodium carbonate and 60 parts by weight water) is added gradually to the system.

After conducting the reaction for about 3 hours at the same temperature, 2.4 parts by weight of ethylenediamine is added to the reaction mixture, and the reaction temperature is increased to 100° C. The reaction mixture is stirred for 2 hours at 100° C. Upon filtering the reaction mixture after cooling, Compound 1 is obtained.

The compound thus obtained is soluble in a dimethylformamide-water 1:1 solvent, and the intrinsic viscosity of the compound in the same solvent is 0.32 at 30.0° C.

Considered from the point of preventing the high molecular compound from being dissolved off during photographic developing or washing, a higher molecular weight is desirable, but dissolution of the compound can be sufficiently prevented if the degree of polymerization thereof is higher than 5 (a

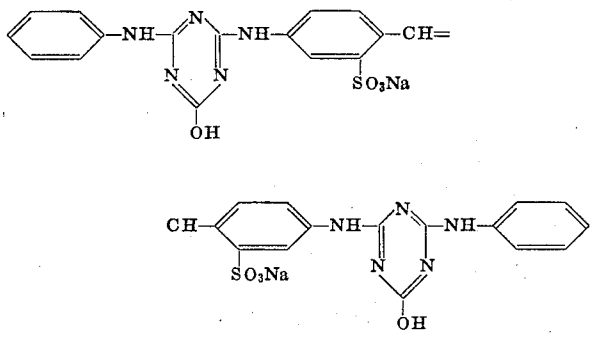
molecular weight greater than about 4,000).

The term "photographic emulsion" in this invention is defined to means the usual gelatino-silver halide light-sensitive emulsions, but synthetic resins such as polyvinyl alcohol and polyvinyl acetal may be effectively employed as protective colloids for the photographic emulsion, in addition to gelatin, in this invention.

Experimental results concerning the ultraviolet inhibiting effect, stain inhibiting effect, antidiffusion properties and fluorescent whitening effect of a photographic light-sensitive element containing the high molecular weight compound of this invention are illustrated by the following examples, but it should be understood that the invention is not to be limited thereby.

EXAMPLE I

Compound 15:



To 1 kg. of a 4% aqueous gelatin solution there was gradually added 100 g. of a 4% water-dimethylformamide (1:1) solution of each of the high molecular compounds 1–14 heretofore described. Compound 15, a known low molecular weight ultraviolet inhibitor, was prepared in the same manner. The resulting mixtures were individually applied to a film base and dried to provide a filter of 2.0 microns thickness. The dissolution state of these compounds was observed. The results are shown in the following table.

Percentage reduction in transmission density (350 Mμ):

	Washing length 30 min.	Washing length 2 hours	(A)** 30 min.	(B)*** 25 min.
Compd. 1	0	2%	0	0
Compd. 2	10%	12%	11%	11%
Compd. 3	0	2%	0	0
Compd. 4	7%	9%	8%	8%
COmpd. 5	10%	12%	11%	11%
Compd. 6	9%	11%	10%	10%
Compd. 7	0	2%	1%	1%
Compd. 8	9%	11%	10%	10%
Compd. 9	2%	5%	3%	3%
Compd. 10	12%	14%	13%	13%
Compd. 11	12%	14%	13%	13%
Compd. 12	11%	12%	11%	11%
Compd. 13	7%	9%	8%	8%
Compd. 14	8%	10%	9%	9%
Compd. 15	85%	95%	90%	90%

Note: (**) 3 % aqueous solution of sodium carbonate,

(***) complete photographic processing.

Thus, while the low molecular weight and diffusible compound (Compound 15) was almost completely dissolved out of the gelatin layer by photographic processing or washing, the high molecular weight compounds of this invention (Compounds 1–14) were only slightly dissolved by the processings, thereby illustrating a good antidiffusion property. "Whole photographic processing" should be taken to mean standard development processes, such as stop fixing, washing, bleach fixing, washing, hardening, washing, and drying.

The intrinsic viscosity of each of the high molecular weight ultraviolet inhibitors of this invention in a dimethylformamide-water (1:1) solvent at 30.0° C. was in the range 0.1–2.0.

EXAMPLE II

A blue-sensitive silver iodo-bromide emulsion containing a yellow coupler, 3,5-dicarboxy-α-(4-stearoylamidobenzoyl) acetanilide was applied to a baryta paper. In this case, a coupler was added to the silver halide emulsion as an aqueous alkaline solution. Then, a green-sensitive chloro-bromide emulsion containing a magenta coupler (1-(3-sulfo-4-phenoxyl)-3-steoaroyl-5-pyrazolone) was emulsion layer. to the blue-sensitive emulsion layer. A red-sensitive silver chloro-bromide emulsion containing a cyan coupler (N-n-octadecyl-1-hydroxy-4-sulfo-2-1-naphthamide) was further applied to the green-sensitive emulsion layer. Finally, a protective layer was applied to the red-sensitive layer thus formed. The thickness of the layers was approximately 2.0 microns. In this case, the protective layer was formed by gradually adding 100 g. of a 4% dimethylformamide-water (1:1) solvent solution of each of the high molecular weight ultraviolet inhibitors of this invention (1–14) to 1 kg. of an aqueous gelatin solution. This was applied and dried.

The color photographic printing paper thus prepared was exposed, developed in a developer containing N-ethyl-N-β-hydroxyethyl-phenylenediamine, and then subjected to stop fixing, washing, bleach fixing, washing, hardening, washing and drying. The printing paper thus processed was then exposed to a xenon tester for 20 hours. Thereafter, the reduction ratio of each color at an image density of 1.0 was measured, the results of which are shown in the following table. THe xenon tester used had a source with an energy distribution similar to that of sunlight.

Color image fading ratio after exposure for 20 hours:

	Cyan	Magenta	Yellow
Compound 1	6%	0	7%
Compound 2	12%	2%	12%
Compound 3	6%	0%	7%
Compound 4	9%	2%	10%
Compound 5	11%	1%	12%
Compound 6	10%	0	11%
Compound 7	8%	0	8%
Compound 8	10%	0	11%
Compound 9	8%	0	8%
Compound 10	12%	2%	13%
Compound 11	12%	2%	13%
Compound 12	11%	1%	12%
Compound 13	9%	0	9%
Compound 14	11%	1%	10%
None (control)	40%	20%	40%

It is clear from the above experimental results that fading of color images was prevented or reduced by incorporating the ultraviolet absorber of this invention in a protective layer. Furthermore, when the ultraviolet absorber of this invention was incorporated in an intermediate layer between the red-sensitive emulsion layer and the green-sensitive emulsion layer, or between the green-sensitive emulsion and the blue-sensitive emulsion layer fading of the color image (or color images) of the emulsion layer (or layers) below the intermediate layer containing the ultraviolet absorber of this invention could be prevented.

The stain-preventing effect of the color photographic printing paper thus processed was measured, the results of which are shown in the following table. The amount of staining is shown by the increase in the yellow component density of of unexposed portion of the printing paper after exposing the printing paper to a xenon tester.

	Yellow component density: Before exposure	After exposure
Compound 1	0.10	0.12
Compound 2	0.10	0.12
Compound 3	0.10	0.12
Compound 4	0.10	0.12
Compound 5	0.10	0.12
Compound 6	0.10	0.12
COmpound 7	0.10	0.12
Compound 8	0.10	0.12
Compound 9	0.10	0.12
Compound 10	0.10	0.12
COmpound 11	0.10	0.12
Compound 12	0.10	0.12
Compound 13	0.10	0.12
Compound 14	0.10	0.12
None (control)	0.12	0.20

It is clear from the above experimental results that by incorporating the high molecular weight ultraviolet absorber of this invention in the protective layer, the formation of stains is effectively prevented.

When the high molecular compound of this invention was incorporated in a protective layer, the whiteness of the color photographic printing paper was greatly improved when compared with a printing paper containing no such high molecular weight compound.

EXAMPLE III

To 1 kg. units of the red-sensitive silver chlorobromide emulsion described in example II there was added 50 g. of a 4% dimethylformamide-water (1:1) solvent solution of each of the high molecular weight ultraviolet inhibitors of this invention (compounds 1–14). After uniform mixing, the described cyan coupler was added thereto. Then, utilizing the resulting silver halide emulsion and the blue-sensitive silver halide emulsion and the green-sensitive silver halide emulsion described in example II, a color photographic light-sensitive printing paper was prepared as in example II.

The multiple layer printing paper thus prepared was exposed and subjected to development, stop fixing, washing, bleach fixing, washing, hardening, washing, and drying. The printing paper thus processed was then exposed to a xenon tester for 20 hours, and the reduction ratio at a color image density of 1.0 was measured, the results of which are shown in the following table.

	Cyan	Magenta	Yellow
Compound 1	15%	0	9%
Compound 2	25%	2%	13%
Compound 3	15%	2%	9%
Compound 4	18%	0	10%
Compound 5	22%	1%	14%
Compound 6	20%	0	12%
Compound 7	17%	0	9%
Compound 8	19%	0	12%
Compound 9	17%	0	9%
Compound 10	23%	2%	13%
Compound 11	24%	2%	14%
Compound 12	22%	2%	13%
Compound 13	17%	0	10%
Compound 14	22%	1%	11%
None (control)	40%	20%	40%

It is clear from the above results, that by incorporating the high molecular ultraviolet absorber of this invention directly in a silver halide emulsion layer, fading due to ultraviolet rays was effectively prevented without the application of an additional ultraviolet inhibiting layer.

EXAMPLE IV

A filter layer containing the high molecular compounds of this invention (Compounds 1–14) was formed on a film at a thickness of about 2.0 microns by the same procedures used in example I. To the filter layer the blue-sensitive silver iodo-bromide emulsion containing the yellow coupler, the green-sensitive silver chloro-bromide emulsion containing the magenta coupler, and the red-sensitive silver chloro-bromide emulsion containing the cyan coupler were applied. Finally, a protective layer was applied to the red-sensitive emulsion layer.

This multiple layer-type light-sensitive film was exposed and subjected to development, stop fixing, washing, bleach fixing, washing, hardening, washing, and drying. Thereafter, the film thus processed was exposed, from the rear side of the film, to a xenon tester for 20 hours. The reduction ratio at each color image density of 1.0 was measured, the results of which are shown in the following table.

	Cyan	Magenta	Yellow
Compound 1	6%	0	12%
Compound 2	10%	2%	16%
Compound 3	6%	0	11%
Compound 4	7%	0	11%
Compound 5	10%	1%	13%
Compound 6	8%	0	13%
Compound 7	7%	0	12%
COmpound 8	8%	0	13%
Compound 9	7%	0	12%
Compound 10	10%	2%	15%
Compound 11	10%	2%	15%
COmpound 12	9%	1%	13%
Compound 13	7%	0	12%
Compound 14	10%	0	12%
None (Control)	40%	20%	40%

It is clear from the above experimental results that by incorporating the high molecular weight ultraviolet absorber of this invention in an undercoat (or the filter layer), the fading of color images could be effectively prevented when compared with fading in the case when no such ultraviolet absorber was incorporated.

When the high molecular weight compound of this invention was incorporated in a backing layer of a multiple layer-type color photographic light-sensitive film instead of incorporating the compound in a filter layer or undercoat, it was found that a comparable reduction in fading could be obtained.

When the high molecular weight ultraviolet absorber of this invention was incorporated in both a protective layer on the uppermost red-sensitive emulsion layer and in an undercoat (or the backing layer), fading due to ultraviolet rays could be effectively prevented when the film was exposed from both sides.

EXAMPLE V

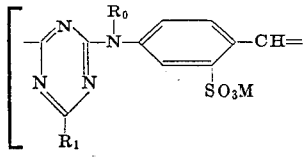
To 1 kg. of a silver chloro-bromide emulsion for enlarged printing papers there was gradually added 10 g. of a 4% dimethylformamide (1:1) solvent solution of each of the high molecular weight compounds of this invention (Compounds 1–14). After adding a hardening agent and a wetting agent, the resulting silver halide emulsion was applied to a baryta paper. When the printing paper thus prepared was subjected to processing, such as development, fixing and washing, the whiteness of the paper was not reduced, whereas when a printing paper containing a known low molecular weight compound (Compound 15) was processed there was a marked reduction in whiteness.

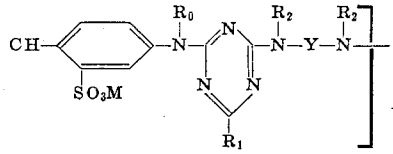
While the invention has been particularly shown and described with reference to preferred embodiments thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the invention.

What is claimed is:

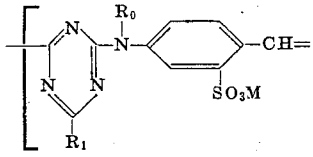
1. A photographic light sensitive element comprising a support having thereon at least one layer containing a high

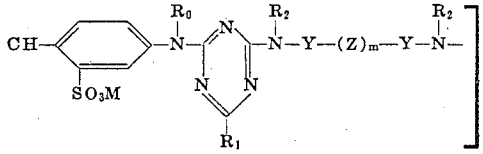
molecular weight compound having a repeating unit selected from the group consisting of



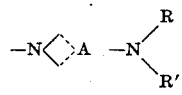


and



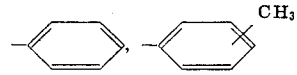


wherein said repeating units are repeated to an order of five or greater, wherein R_0 and R_2 each represents a member selected from the group consisting of a hydrogen atom, an alkyl group having from 1–8 carbon atoms, an aryl group having 6–12 carbon atoms, a hydroxyalkyl group having 2–4 carbon atoms, a substituted hydroxyalkyl group having 2–4 carbon atoms, a sulfoalkyl group having 1–4 carbon atoms, an alkali metal salt of a sulfoalkyl group having 1–4 carbon atoms and an ammonium salt of a sulfoalkyl group having 1–4 carbon atoms; R_1 represents a member selected from the group consisting of a halogen atom, —OR, —SR,

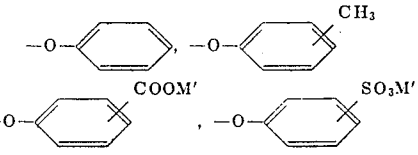


, wherein R and R′ each represents a member selected from the group consisting of (i) a hydrogen atom, (ii) an alkyl group having 1–12 carbon atoms, a hydroxyalkyl group having 1–12 carbon atoms, a sulfoalkyl group, an alkali salt of a sulfoalkyl group, an ammonium salt of a sulfoalkyl group, a carboxyalkyl group, an alkali metal salt of a carboxyalkyl group, an ammonium salt of a carboxyalkyl group, an aralkyl group; (iii) an aryl group having 6–18 carbon atoms, a hydroxy derivative of an aryl group having 6–18 carbon atoms, a carboxy derivative of an aryl group having 6–18 carbon atoms, a sulfonic acid derivative of an aryl group having 6–18 carbon atoms, an alkali metal salt of an aryl group having 6–18 carbon atoms, an ammonium salt of an aryl group having 6–18 carbon atoms, and (iv) a cycloalkyl group having 6–10 carbon atoms, a substituted cycloalkyl group having 6 –10 **26** atoms; a represents a member selected from the group consisting of an alkylene group having four to five carbon atoms an alkylene group containing a heteroatom, and an alkylene group containing a heteroatomic group: Y represents a member selected from the group consisting of an alkylene group having 2–10 carbon atoms, a substituted alkylene group having 2–10 carbon atoms, an allylene group having 6–18 carbon atoms, a substituted allylene group having 6–18 carbon atoms; Z represents a member selected from the group consisting of O,S,SO_2 and a divalent heteroatomic group; M represents a member selected from the group consisting of an alkali metal atom and NH_4; and *m* is 0 or 1.

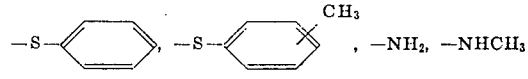
2. A photographic light sensitive element as in claim 1 wherein R_0 and R_2 are selected from the group consisting of —H, —CH_3, —C_2H_5, —C_3H_7, —$CH_2CH(CH_3)_2$,



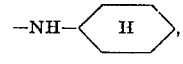
—CH_2CH_2OH, —$CH_2CH_2CH_2OH$, —$CH_2CH_2OCH_3$, —$CH_2CH_2OC_2H_5$, —CH_2—SO_3M', —$(CH_2)_3$—SO_3M', and —$(CH_2)_4SO_3M'$, wherein M′ is selected from the group consisting of H, Na, K, and NH_4, R_1 is selected from the group consisting of —OH, —OCH_3, —OC_2H_5, —OC_3H_7,

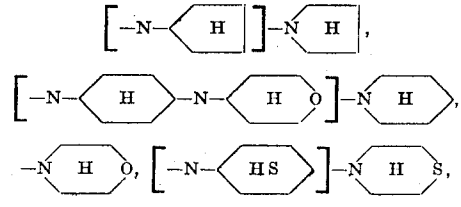


, —S—CH_3, —S—C_2H_5,

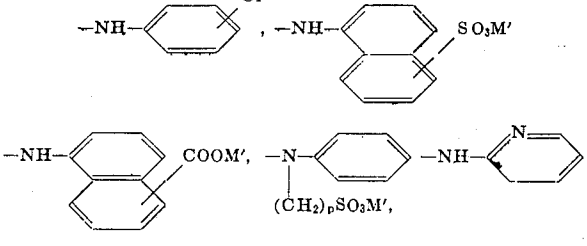


, NH_2, —NHC_3, —NHC_2H_5, —NHC_4H_9, —NHC_6H_{13},

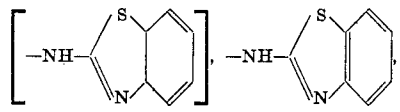




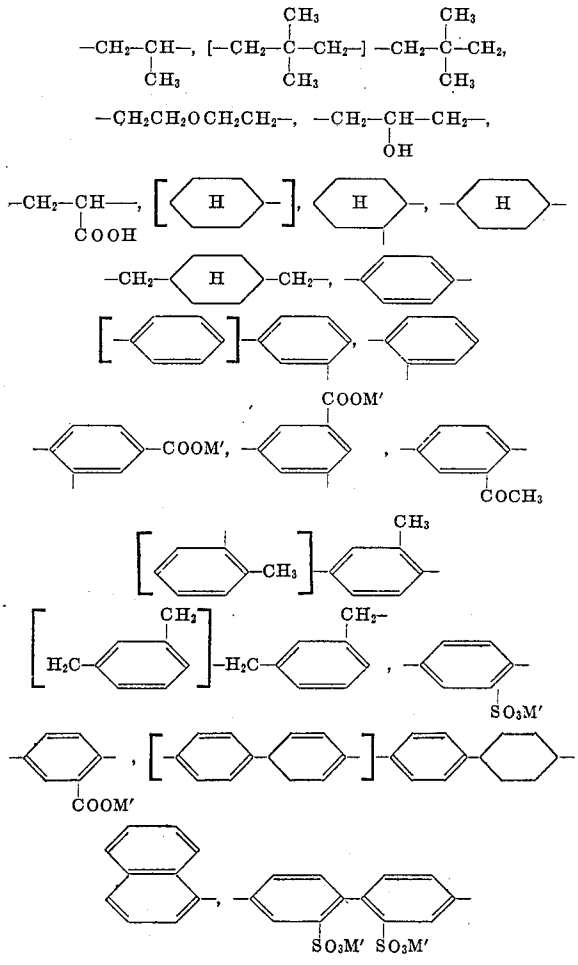
, —NHC_8H_{17}, —$NHC_{12}H_{25}$, —$N(CH_3)_2$, —$N(C_2H_5)_2$, —$N(C_4H_9)_2$, —$NHCH_2CH_2OH$, —$N(CH_2CH_2OH)_2$, —$NH(CH_2)SO_3M'$, where M′ is selected from the group consisting of H, Na, K and NH_4, and p is 1, 2 3 or 4, —$NH(CH_2)_p$—COOM′,

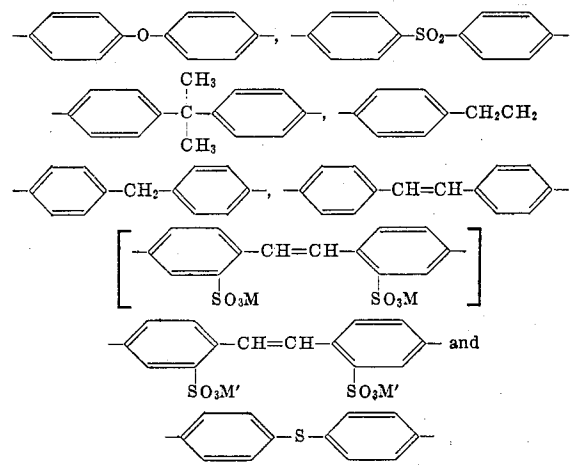


and



where M′ and *p* have the same meaning as above, Y is a member selected from the group consisting of [—$(CH_2)_q$] —$(CH_2)_q$—, where *q* may vary from 2 to 10,





where M′ is a member selected from the group consisting of H, Na, K and NH_4.

3. A photographic light sensitive element as claimed in claim 1 wherein said layer is an intermediate layer.

4. A photographic light sensitive element as claimed in claim 1 wherein the layer is a photographic emulsion layer.

5. A photographic light sensitive element as claimed in claim 1 wherein the layer is a protective layer.

6. A photographic light sensitive element as claimed in claim 1 wherein the layer is a subbing layer

7. A photographic light sensitive element as claimed in claim 1 wherein the layer is a backing layer.

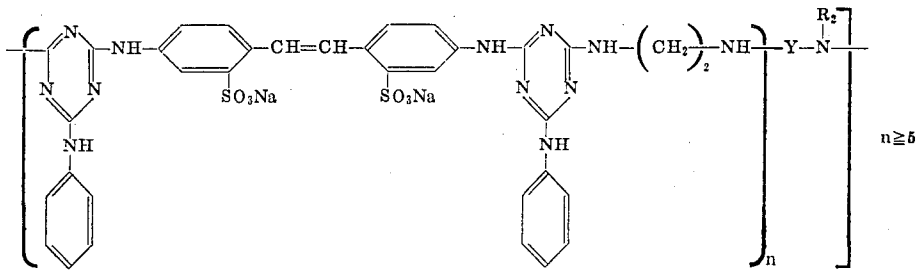
8. A photographic light sensitive element as claimed in claim 1 wherein the layer is a baryta layer.

9. A photographic light sensitive element as claimed in claim 1 wherein said support is a paper.

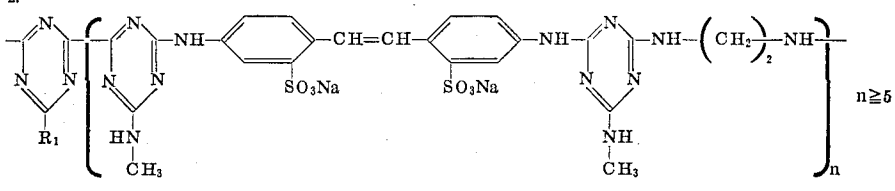
10. A photographic light sensitive element as claimed in claim 1 wherein said support is a film.

11. A photographic light sensitive element as claimed in claim 1 wherein said high molecular weight compound is 1 member selected from the group consisting of compounds represented by the general formulas:

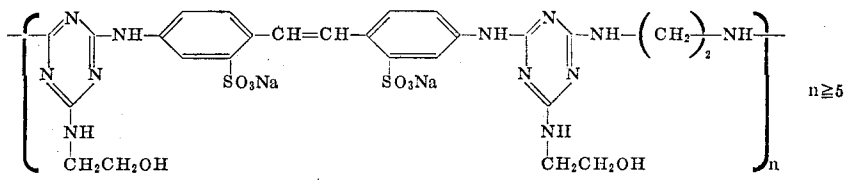
1.



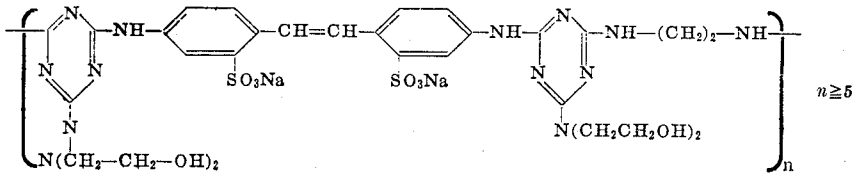
2.



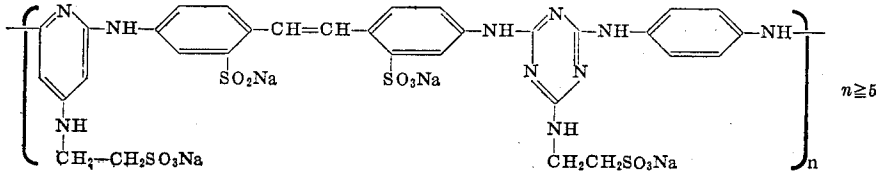
3.



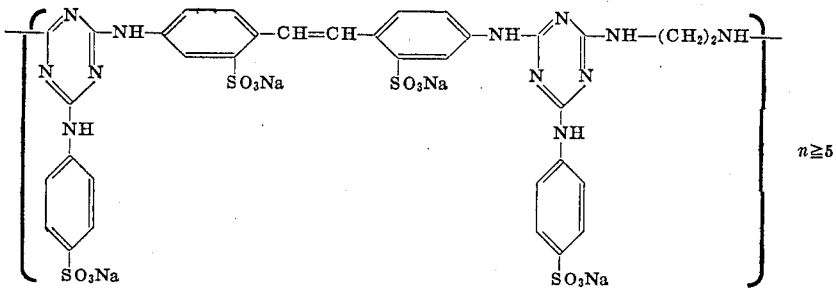
4



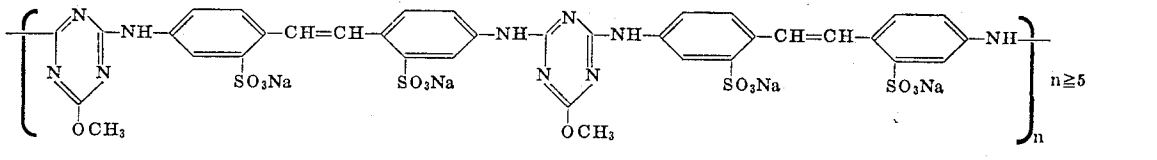
5



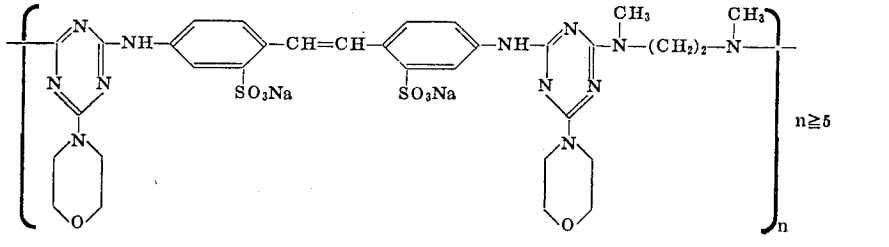
6



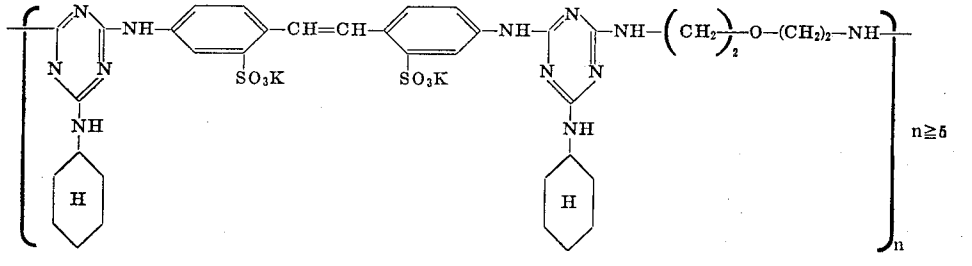
7.



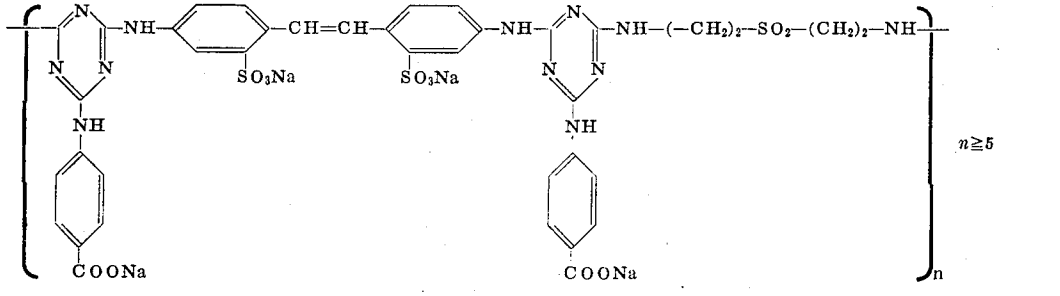
8.



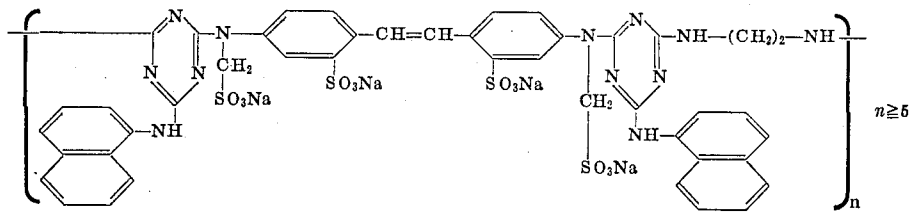
9.



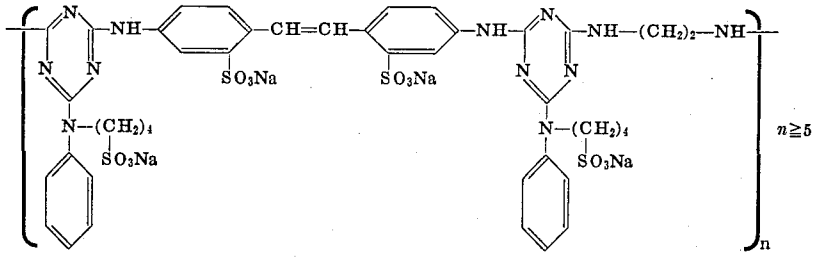
10.



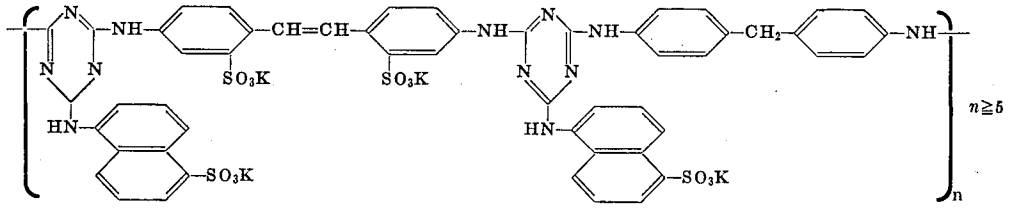
11.



12.



13.



14.