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DEFOAMING AGENT FOR PULP AND PAPER STOCK

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This invention relates to a new and improved defoaming agent and more particularly to a new and improved defoaming agent which is particularly suitable for use in the paper industry.

A number of defoaming agents have been developed in the prior art for preventing or minimizing difficulties in paper manufacture caused by foaming of the paper stock. Some of these compositions have enjoyed substantial commercial success, but it has been found that in certain instances some of them do not give as satisfactory results as are desired. For one thing some of these compositions are not as stable to acid conditions as is desired. This is a very important factor inasmuch as it is common practice in many paper mills to add alum, i. e. aluminum sulfate, to the paper stock in order to form an insoluble, water repellent aluminum resinate from the aluminum ion in the alum and the sodium resinate which is added to the paper stock. This insoluble water repellent aluminum resinate deposits upon the individual fibers of the paper stock and thus aids in producing a paper having a certain degree of water repellency. Since aluminum sulfate has a rather acid reaction, the addition of it to a paper stock causes the paper stock also to have an acid reaction. In many cases it is found that the paper stock will have a pH of 4.5 or lower. The acidity of the paper stock tends to cause emulsions of defoaming agents to break and thus the defoaming agents not to remain uniformly dispersed in the paper stock. Furthermore, the ingredients of such defoaming agents, after the emulsions thereof break, usually tend to rise to the upper portion of the paper stock inasmuch as they have a specific gravity of less than one whereas the paper stock has a specific gravity very close to one. In so concentrating in the upper portion of the paper stock, it seems that these ingredients tend to carry the pitch which is contained in the paper stock along with them into the upper layers. Then when the sheet passes through the rolls of the paper machine, the pitch which appears to be concentrated in the upper surface of the sheet causes the sheet to stick to the rolls with the result that the sheet often becomes torn or broken. With Fourdrinier machines very serious difficulties have been encountered when attempting to control foaming in paper stocks having an acid pH. In particular, it has been found that the paper sheet often tends to stick and to break at the dandy roll and first press roll. Such sticking of the paper sheet at the dandy roll and first press roll with the resultant breaking of the sheet is very undesirable, of course, since it causes a considerable loss of time in the paper making process and results in the damaging of a considerable amount of paper.

Another disadvantage of certain of the prior art defoaming agents is that they are not as stable when emulsified in hard water as is desired. This is an important factor since the defoaming agents in many cases are emulsified in water and placed in a suitable container above the sheet on the Fourdrinier machine and the defoaming agent allowed to slowly trickle or flow from the container

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into the paper stock. If the water which is used in forming the dilute emulsion from some of the concentrated defoaming agents of the prior art has any appreciable degree of hardness, the defoaming agents tend to break out from the emulsion and rise to the top of the container. Thus the solution of the defoamer which is running into the paper stock will not contain a sufficient amount of the defoaming agent to effectively prevent foaming until the greater part of the solution has run out of the container. At that time, the material which is running into the paper stock will be much more concentrated than necessary. Thus in such cases it will be found that the defoaming action of the solution will be very irregular and will not be at all satisfactory. Another instance where it is necessary to have a defoaming agent which is stable to hard water is when the defoaming agent is fed to the paper making machines by means of a pump such as when it is desirable to feed the defoaming agent from one source to a number of machines. In such cases it has been found that the pipes leading from the container for the defoaming agent and from the pumping device to the various paper machines sometimes become clogged up since the hard water may cause breaking of the emulsion of the defoaming agent which remains in the pipes from one day to another or when the defoamer is not being used. When the emulsion breaks, some of the ingredients of the defoaming agent which separate therefrom tend to clog up the joints in the pipes. Then when it is desired to resume operations it is sometimes necessary to employ steam to clean out the pipes so that a free flow of the defoaming agent may be obtained. Still another instance where it is very desirable to have a defoaming agent which is stable to hard water is in the production of calcium carbonate filled paper. Many grades of magazine paper contain as much as 15% or more of calcium carbonate as a filler to impart a high degree of opaqueness and a desirable finish to the paper. This calcium carbonate is usually incorporated into the paper stock, that is, when the paper is being made on a Fourdrinier machine, at the fan pump or in the white water from the trays. This large amount of calcium carbonate substantially increases the hardness of the water in the slurry and if a defoaming agent is being used which is not stable to hard water, the effectiveness of the defoamer may be greatly impaired. Sticking of the sheet may occur at the dandy and first press rolls with resulting breakage just as in the case when paper stock having a relatively acid pH is employed.

It has also been found that some of the defoaming agents of the prior art are not as stable to various inorganic salts as is desired. It is important in many cases that a defoaming agent which is stable to inorganic salts be available since it is common practice in many instances to add clays, carbonates (as mentioned above) and other fillers to the paper stock in order to produce a particular grade of paper. Also as previously mentioned, alum is frequently added to paper stock and it exerts a salt effect, of course, in addition to the acidity which it has. Furthermore, in many cases, paper manufacturers make various grades of paper from used cardboard boxes and containers. Many of these paper containers, particularly corrugated boxes, etc., are made by binding various layers or sheets of paper together using adhesives such as sodium silicate. Thus pulp which is obtained from such used cardboard containers contains appreciable quantities of sodium silicate, thus adding to the salt concentration present in the pulp and paper stock.

It is thus seen that there is a need for a new and improved defoaming agent which will be stable in acid conditions, in hard water and in the presence of large amounts of inorganic salts.

It is the object of this invention to provide a new and improved defoaming agent.

A further object of the invention is to provide a new and improved defoaming agent which is stable in acid conditions as well as in alkaline conditions, which is stable in hard water and which is stable in the presence of relatively large amounts of inorganic salts.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

I have discovered that the above and other objects of the invention are accomplished by providing a defoaming agent made up of a paraffin hydrocarbon containing at least 12 carbon atoms, e. g. a mineral wax, a partial ester of a polyhydric alcohol and a higher fatty acid, an ester of a lower monohydric alcohol and a higher fatty acid, a fatty acid mono ester of a polyethylene glycol having a molecular weight of from about 200 to about 4000 and water. It has been found in actual practice in the paper mills that the compositions of the present invention are far superior to the compositions of the prior art whenever any of the three factors referred to hereinabove, i. e., acid conditions, hard water, or presence of relatively large quantities of inorganic salts, is present. The compositions of the present invention were found to eliminate entirely the troubles referred to above with regard to sticking and breaking of the sheets at the dandy roll and first press roll on Fourdrinier machines. In a number of mills the compositions of the present invention have substantially supplanted the compositions of the prior art whenever any of the adverse conditions referred to above are present.

In preparing the compositions of the invention, a mineral wax such as scale wax is preferably used; however, other paraffin hydrocarbons containing at least 12 carbon atoms such as paraffin oil, paraffin wax, microcrystalline wax, etc., are also very suitable either alone or in admixture with scale wax. The scale wax can be admixed with a mineral oil such as paraffin oil so as to produce a softer product than would be obtained using a mineral wax alone. The mineral wax or other paraffin hydrocarbon or mixture of hydrocarbons should make up from about 3% to about 15%, with from about 4% to about 10% being the preferred range, of the original concentrated semi fluid-like composition which is prepared for shipment to the paper mills. The compositions can also contain a small amount of other waxes which serves to modify the nature of the mineral wax such as, for example, candelilla wax which has a higher melting point than the mineral wax. In most cases, however, it is preferred that the compositions be prepared so that the concentrated products will be in more or less of a semi-fluid state so that they will be more readily dispersible in cold water.

Another of the essential ingredients of the new defoaming agents is a partial ester of a polyhydric alcohol and a higher fatty acid such as glyceryl mono-oleate, glyceryl monostearate, glyceryl monoricinoleate, ethylene glycol monostearate, ethylene glycol mono-oleate, diethylene glycol monostearate, diethylene glycol mono-oleate and mono esters of fatty acids with polyhydroxy alcohols such as sorbitol, mannitol, etc. The fatty acid which is used in preparing these monoesters is a higher fatty acid, preferably one having at least 14 carbon atoms although fatty acids having from 14 to 22 carbon atoms are suitable. The fatty acid can be straight chain or branch chain and can be saturated, unsaturated, hydroxylated, etc. The expression "partial ester" is used herein to connote an ester of a polyhydric alcohol in which at least one of the hydroxyl groups remains free or unesterified. The concentrated compositions as shipped to the paper mill should contain from about 3% to about 15% of such a partial ester with from about 5% to about 10% being the preferred amount of such an ester in the concentrated compositions.

The fatty acid ester of a lower monohydric alcohol which makes up another of the essential ingredients of

the present compositions is prepared from fatty acids containing at least 14 carbon atoms, and fatty acids containing from 14 to 22 carbon atoms are suitably employed. The fatty acid can be straight chain or branch chain and can be saturated, hydroxylated, unsaturated, etc. Alcohols suitable for preparing such esters are alcohols containing 8 or less carbon atoms and which contain only one hydroxy group, e. g. methanol, ethanol, propanol, butanol, pentanol, hexanol, heptanol, octanol, and isomers of these various alcohols. Preferably fatty acid esters of methanol are employed in view of the relatively low cost of methyl alcohol in comparison to the cost of the other monohydric alcohols; however, if desired, any of the other above monohydric alcohols can be used. Preferably the concentrated compositions of the invention contain from about 3% to about 15% of these monohydric alcohol esters and in most instances from about 4% to about 10% of such an ester is present in the concentrated compositions of the invention.

The esters of a polyethylene glycol which make up a further essential ingredient of the compositions of the invention are either the mono or the diesters of the particular polyethylene glycol being employed. These esters are prepared from fatty acids containing from 14 to 22 carbon atoms and from polyethylene glycols having a molecular weight of from about 200 to about 4000. Thus polyethylene glycols having molecular weights of from about 200 to about 4000 are either mono or diesterified with fatty acids such as oleic acid, stearic acid, palmitic acid, ricinoleic acid, etc. to form the polyethylene glycol esters used in preparing the compositions of the invention. The concentrated compositions of the invention as shipped to the paper mill should contain from about 3% to about 15% of such esters with from about 4% to about 10% being the preferred amount of such esters in the concentrated compositions of the invention.

The remainder of the compositions of the invention is made up substantially of water although small amounts of materials such as formaldehyde, which may be added as a preservative, and various other materials may be added to the compositions if desired. The compositions of the invention as shipped to the paper mill will in most cases contain from about 50% to about 80% of water.

In forming the compositions of the invention, the ingredients thereof which are solids are melted and then those ingredients of the compositions which are liquids are admixed with the melted materials. It is preferred to admix all of the nonaqueous materials at a temperature at which all of these materials are liquid, prior to admixing the water therewith. However, any suitable order of steps in admixing the various ingredients to produce the defoaming agents of the invention can be utilized. The final concentrated product which is obtained will be in most cases a white, semi-fluid material at room temperature.

The concentrated product, when it is used by the paper mill, is preferably diluted with water until the nonaqueous ingredients make up from about 0.5% to 1% by weight of the diluted emulsion although much more dilute emulsions, e. g. 0.02% to 0.1%, can be used as is apparent from Example I appearing hereinafter. The compositions of the present invention are very readily dispersible in additional water merely by gently agitating the concentrated product with water preferably at a temperature of about 100° F. This is another substantial advantage of the products of the present invention over some of the prior art products since it is necessary when diluting some of the prior art defoamers to employ considerable agitation and to heat the water which is to be admixed therewith to a temperature of at least 150° F. Thus it is seen that the compositions of the present invention are readily diluted prior to use in the paper mill.

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The diluted compositions are preferably added to the paper stock suspensions in such an amount so that the non-aqueous materials of the defoaming agent are present in an amount of from about 1 to about 5 parts per million parts of the paper stock suspension or from about 0.01% to about .05% of the dry weight of the pulp in the stock suspension. The diluted emulsions can be added as needed and in any desired manner, however, to a paper making machine such as a Fourdrinier or cylinder type machine and they will very effectively inhibit the formation of undesirable foam under nearly all conditions of operation.

For a fuller understanding of the nature and objects of the invention, reference may be had to the following examples which are given merely as further illustrations of the invention and are not to be construed in a limiting sense.

Example I

A concentrated defoaming agent was prepared by admixing 5 parts of a scale wax having a melting point of 124-126° F., 5 parts of paraffin oil, 5 parts of glyceryl monostearate, 10 parts of methyl ricinoleate, 10 parts of the monostearate ester of a polyethylene glycol having a molecular weight of approximately 400, 64.6 parts of water and 0.4 parts of 40% aqueous formaldehyde. The composition was prepared by admixing the first five ingredients at a temperature of about 60° C. at which temperature all of these materials were in a fluid condition. To the clear mixture, the water was added slowly at 60° C. with stirring. Agitation of the mixture was continued as the material was allowed to cool to about 35° C. Then the small amount of formaldehyde which served as a preservative was admixed with the defoaming agent. The product which was obtained was a white, semi-fluid material at room temperature.

This composition was readily diluted with additional water at a temperature of 100° F. to form a dilute emulsion containing 0.1% of the above product. This dilute emulsion was sprayed upon the wire of a Fourdrinier machine at a point about 5 to 15 feet from the slice. Substantially no foaming developed and it was found that no sticking whatever occurred at the dandy roll or first press roll and thus no breaking whatever of the sheet occurred even after several hours of continuous running of the machine. The pulp which was being used contained a moderate amount of alum and had a pH of 6.7. Prior to the use of the compositions of the present invention, this mill had had very serious difficulties when manufacturing paper from this paper stock.

The defoaming agent of this example was also used with a very high degree of success on several other machines in the same paper mill which were producing paper from various types of paper stocks. The pH of these stocks varied from neutrality to a pH of 5; several of them contained fairly large amounts of rosin size and alum; and several of them contained large amounts of clay and/or calcium carbonate as fillers, etc. The defoaming agent of the present invention gave uniformly excellent results under these rigorous conditions.

Example II

Another composition of the invention was prepared in substantially the same manner as the composition of Example I. The composition of the present example, however, contained 2.5 parts of scale wax, 2.5 parts of paraffin oil, 8 parts of the mono ester of glycerine formed by reacting one mole of monohydroxystearic acid with one mole of glycerine, 5 parts of methyl ricinoleate, 5 parts of the monostearate ester of a polyethylene glycol having a molecular weight of approximately 400, 0.4 part of 40% aqueous formaldehyde and 76.6 parts of water. This composition was a very excellent defoamer as was shown by its very outstanding performance when tested by the glue test which is frequently used to determine the

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effectiveness as a defoamer of a composition which is believed to have defoaming properties. This test is carried out by admixing 85 parts of water, 10 parts of glue and 5 parts of a 2% solution of the material whose defoaming effectiveness is to be determined. This mixture is then placed into a 250 cc. low form beaker and rapidly agitated for 1 minute. The height of the foam in mms. is measured after the mixture is agitated for 1 minute and then at 1 minute and 2 minute intervals after the agitation of the mixture has ceased. It was found that the composition of Example II was a very effective defoamer since after agitating a mixture containing 85 parts of water, 10 parts of glue and 5 parts of a 2% aqueous emulsion of the composition of the example, only 5 mms. of foam were present on top of the mixture. One minute after agitation had ceased all of the foam in the beaker had entirely disappeared. A corresponding test which was run using 90 parts of water and 10 parts of glue with no defoamer present gave 28 mms. of foam on top of the mixture after 1 minute of agitation. The entire amount of foam remained on top of this mixture even after the mixture was allowed to stand for 2 minutes after agitation had ceased. Thus it was apparent that the composition of Example II was a very effective defoaming agent.

Example III

Another one of the excellent defoamers of the present invention has the following formula:

	Parts
Scale wax	3
Paraffin oil	3
Glyceryl monostearate	8
Methyl ricinoleate	6
Monostearate ester of a polyethylene glycol having a molecular weight of about 400	6
Water	73.6
Formaldehyde (40% aqueous)	0.4

Example IV

Another product of the invention was prepared containing an antichlor (an agent to remove the influence of any residual chlorine in the paper stock). In some paper mills it is believed that residual chlorine in the paper stock system from the bleaching plant helps to cause a bad foam condition. Sodium thiosulfate ($\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$) was incorporated into the following defoaming agent of the invention to aid in overcoming the foam condition caused by such residual chlorine:

	Parts
Scale wax	1.5
Paraffin oil	2.5
Glycerol mono ester of hydroxystearic acid	6.5
Methyl ricinoleate	4.0
Monostearate ester of a polyethylene glycol having a molecular weight of about 400	4.0
$\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$	4.0
Water	77.1
Formaldehyde (40% aqueous)	0.4

Example V

Three other products illustrating the novel defoamers of my invention have the following compositions:

A

	Parts
Paraffin wax	8
Glyceryl mono-oleate	9
Butyl palmitate	8
Monolaurate ester of a polyethylene glycol having a molecular weight of about 200	12
Water	63
	100

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B	
	Parts
Paraffin wax-----	12
Glyceryl monopalmitate-----	6
Ethyl oleate-----	9 5
Dilaurate ester of a polyethylene glycol having a molecular weight of about 1000-----	9
Water -----	64
	100 10
C	
	Parts
Paraffin wax-----	10
Glyceryl monolaurate-----	14
Methyl stearate-----	10 15
Monostearate ester of a polyethylene glycol having a molecular weight of about 4000-----	5
Water -----	61
	100 20

The effectiveness of the three above products as defoaming agents was determined by the glue test as outlined in Example II hereinabove. As in Example II, a concurrent test was made on a glue solution which had not had a defoaming agent added thereto (this is referred to as the "Blank" in the following tabulation of the results). The results of these tests are as follows:

	Height of Foam in Mms.		
	After One Minute of Agitation	One Minute After Agitation Ceased	Two Minutes After Agitation Ceased
Blank-----	29	29	29 35
Product A-----	10	9	8
Product B-----	12	11	10
Product C-----	10	9	7

Although the products of the invention are of particular value for the prevention and elimination of foam in various phases of paper manufacture, they are also excellent defoamers for many other purposes. They readily and effectively eliminate foam in many types of aqueous mixtures which are encountered in industry. As is evident from the above examples, the products of the invention very effectively eliminate foaming in aqueous glue solutions.

Having described my invention what I claim as new and desire to secure by Letters Patent is:

1. A defoaming agent for pulp and paper stock consisting essentially of an aqueous emulsion made up of from about 3 parts to about 15 parts of a paraffin hydrocarbon containing at least 12 carbon atoms, from about 3 parts to about 15 parts of a partial ester of a polyhydric alcohol and a fatty acid having from 14 to 22 carbon atoms, from about 3 parts to about 15 parts of a fatty acid ester of a monohydric alcohol containing not more than 8 carbon atoms and a fatty acid containing from 14 to 22 carbon atoms, from about 3 parts to about 15 parts of an ester of a polyethylene glycol having a molecular weight of from about 200 to about 4000 and a fatty acid containing from 14 to 22 carbon atoms, and water with the amount of water in the emulsion not exceeding about 99.98% of the emulsion.

2. A defoaming agent for pulp and paper stock consisting essentially of an aqueous emulsion made up of from about 3 parts to about 15 parts of a mixture of a mineral wax and a mineral oil, from about 3 parts to about 15 parts of a partial ester of a polyhydric alcohol and a fatty acid having from 14 to 22 carbon atoms, from about 3 parts to about 15 parts of a fatty acid ester of a monohydric alcohol containing not more than 8 carbon atoms and a fatty acid containing from 14 to 22 carbon atoms, from about 3 parts to about 15 parts of an ester of a polyethylene glycol having a molecular weight of from

about 200 to about 4000 and a fatty acid containing from 14 to 22 carbon atoms, and water with the amount of water in the emulsion not exceeding about 99.98% of the emulsion.

3. A defoaming agent for pulp and paper stock consisting essentially of an aqueous emulsion made up of from about 3 parts to about 15 parts of a mineral wax, from about 3 parts to about 15 parts of a monoglyceride the fatty acid radical of which contains from 14 to 22 carbon atoms, from about 3 parts to about 15 parts of a methyl ester of a fatty acid having from 14 to 22 carbon atoms, from about 3 parts to about 15 parts of an ester of a polyethylene glycol having a molecular weight of from about 200 to about 4000 and a fatty acid containing from 14 to 22 carbon atoms, and water with the amount of water in the emulsion not exceeding about 99.98% of the emulsion.

4. A defoaming agent for pulp and paper stock consisting essentially of an aqueous emulsion made up of from about 3 parts to about 15 parts of a mixture of a mineral wax and a mineral oil, from about 3 parts to about 15 parts of a monoglyceride the fatty acid radical of which contains from 14 to 22 carbon atoms, from about 3 parts to about 15 parts of a methyl ester of a fatty acid having from 14 to 22 carbon atoms, from about 3 parts to about 15 parts of an ester of a polyethylene glycol having a molecular weight of from about 200 to about 4000 and a fatty acid containing from 14 to 22 carbon atoms, and water with the amount of water in the emulsion not exceeding about 99.98% of the emulsion.

5. A defoaming agent for pulp and paper stock consisting essentially of an aqueous emulsion made up of from about 3 parts to about 15 parts of a mineral wax, from about 3 parts to about 15 parts of glyceryl monostearate, from about 3 parts to about 15 parts of methyl ricinoleate, from about 3 parts to about 15 parts of an ester of a polyethylene glycol having a molecular weight of between about 400 and about 1000 and a fatty acid containing from 14 to 22 carbon atoms, and water with the amount of water in the emulsion not exceeding about 99.98% of the emulsion.

6. A defoaming agent for pulp and paper stock consisting essentially of an aqueous emulsion made up of from about 3 parts to about 15 parts of a mineral wax, from about 3 parts to about 15 parts of the monoglyceride of monohydroxystearic acid, from about 3 parts to about 15 parts of methyl ricinoleate, from about 3 parts to about 15 parts of an ester of a polyethylene glycol having a molecular weight of between about 400 and about 1000 and a fatty acid containing from 14 to 22 carbon atoms, and water with the amount of water in the emulsion not exceeding about 99.98% of the emulsion.

7. A defoaming agent for pulp and paper stock consisting essentially of an aqueous emulsion made up of from about 3% to about 15% of a paraffin hydrocarbon containing at least 12 carbon atoms, from about 3% to about 15% of a partial ester of a polyhydric alcohol and a fatty acid having from 14 to 22 carbon atoms, from about 3% to about 15% of a fatty acid ester of a monohydric alcohol containing not more than 8 carbon atoms and a fatty acid containing from 14 to 22 carbon atoms, and from about 3% to about 15% of an ester of a polyethylene glycol having a molecular weight of from about 200 to about 4000 and a fatty acid containing from 14 to 22 carbon atoms, the balance of the emulsion being substantially all water.

8. A defoaming agent for pulp and paper stock consisting essentially of an aqueous emulsion made up of from about 3% to about 15% of a mineral wax, from about 3% to about 15% of a monoglyceride the fatty acid radical of which contains from 14 to 22 carbon atoms, from about 3% to about 15% of a methyl ester of a fatty acid having from 14 to 22 carbon atoms, and from about 3% to about 15% of an ester of a polyethylene glycol having a molecular weight of from about 200 to

about 4000 and a fatty acid containing from 14 to 22 carbon atoms, the balance of the emulsion being substantially all water.

9. A defoaming agent for pulp and paper stock consisting essentially of an aqueous emulsion made up of from about 3% to about 15% of a mineral wax, from about 3% to about 15% of glyceryl monostearate, from about 3% to about 15% of methyl ricinoleate, and from about 3% to about 15% of an ester of a polyethylene glycol having a molecular weight of between about 400 and about 1000 and a fatty acid containing from 14 to 22 carbon atoms, the balance of the emulsion being substantially all water.

10. A defoaming agent for pulp and paper stock consisting essentially of an aqueous emulsion made up of from about 3% to about 15% of a mineral wax, from about 3% to about 15% of the monoglyceride of monohydroxystearic acid, from about 3% to about 15% of methyl ricinoleate, and from about 3% to about 15% of an ester of a polyethylene glycol having a molecular weight of between about 400 and about 1000 and a fatty acid containing from 14 to 22 carbon atoms, the balance of the emulsion being substantially all water.

11. A defoaming agent for pulp and paper stock consisting essentially of an aqueous emulsion made up of from about 3% to about 15% of a mixture of a mineral wax and a mineral oil, from about 3% to about 15% of glyceryl monostearate, from about 3% to about 15%

of methyl ricinoleate, and from about 3% to about 15% of an ester of a polyethylene glycol having a molecular weight of between about 400 and about 1000 and a fatty acid containing from 14 to 22 carbon atoms, the balance of the emulsion being substantially all water.

12. A defoaming agent for pulp and paper stock consisting essentially of an aqueous emulsion made up of from about 3% to about 15% of a mixture of mineral wax and a mineral oil, from about 3% to about 15% of the monoglyceride of monohydroxystearic acid, from about 3% to about 15% of methyl ricinoleate, and from about 3% to about 15% of an ester of a polyethylene glycol having a molecular weight of between about 400 and about 1000 and a fatty acid containing from 14 to 22 carbon atoms, the balance of the emulsion being substantially all water.

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