

INK ERADICATOR SYSTEM

This invention relates to ink eradicator systems.

Eradicator fluids which contain a
5 reducing agent that will cause the dye component
of an ink to be reduced to a colorless form are
commonly used, e.g., in the graphic arts, to
correct ink markings. The reducing agent used
is generally a reducing sulfur compound, e.g., a
10 sulfite salt. These fluids often suffer from
the disadvantage that a new marking, made over
the eradicator fluid, will also disappear due to
the presence of the reducing agent.

Many solutions to this problem have
15 been proposed. For example, in some instances a
second, different ink has been used to write
over the eradicator fluid. Others have proposed
that the proportion of the sulfite salt in the
eradicator fluid be reduced.

20 European Patent Application No. 0032652
teaches an eradicator fluid in which the sulfite
salt reducing agent is replaced with a basic
nitrogen compound. As discussed in U.S.
5,006,171, the resulting eradicator fluids are
25 typically highly alkaline, which may cause
damage to the paper structure such that upon
overwriting the paper fibers may be pulled out.

In general, the invention features an ink eradicator system including an eradicator fluid that includes a reducing agent, a film-forming polymer and water. The system also includes an ink containing a colorant that is reduced by the reducing agent to colorless form. The eradicator fluid of the invention readily removes markings made with an ink containing a reducible colorant, and allows a mark to be made over the eradicator fluid almost immediately (e.g., within 20 seconds) after the eradicator fluid is applied. Advantageously, the mark can be made using most conventional inks, including the same ink that has been eradicated, without the eradicator fluid causing the mark to disappear, even when the user has applied excessive amounts of the eradicator fluid, e.g., by making repeated passes over the mark to be eradicated, using the eradicating instrument in a manner similar to an eraser.

In one aspect, the eradicator fluid includes a reducing sulfur compound, a film-forming polymer and water.

In another aspect, the eradicator fluid includes a reducing agent, at least 8% and preferably at least 15% by weight of a film-forming polymer, and water.

In preferred embodiments, the film-forming polymer is an acrylic polymer, preferably provided in the form of an emulsion. Preferred acrylic polymers include polymethacrylates, polyacrylates and mixtures thereof. A particularly preferred polymer is RHOPLEX AC-261, a blend of butylacrylate and methylmethacrylate copolymers in the form of an emulsion, commercially available from Rohm & Haas. Other polymers which may be used include

water-soluble salts of styrene maleic anhydride copolymers and water-soluble acrylic resins.

A preferred eradicator fluid includes from about 0.5 to 4.0 weight percent reducing agent, from about 5 to 40 weight percent film-forming polymer (on a solids basis), and from about 55 to 95 weight percent water.

In another aspect, the invention features a pen having a tip at each end, and a pair of reservoirs. Each reservoir extends from each tip towards the center of the pen. One of the reservoirs contains an eradicator fluid of the invention, and the other contains an ink containing a colorant capable of being reduced by the eradicator fluid.

In a further aspect, the invention features a pen system which includes a plurality of pens, one pen containing an eradicator fluid of the invention, and the remaining pens containing one or more inks of the invention.

If more than one ink-containing pen is provided, the pens preferably contain inks having different colors. Preferably, the pens are ball point pens. In one preferred embodiment, each ball point pen includes a tubular member for fluid communication with a reservoir, a socket, having a seat, at one end of the member, an interior wall surface extending from the seat, a rim disposed at the end of the interior wall surface opposite the seat, and a spherical ball that is disposed in the socket, rotatably engagable with the seat and captured by the rim.

Other features and advantages of the invention will be apparent from the Description of the Preferred Embodiments thereof, and from the claims.

The preferred embodiments include an eradicator fluid containing a reducing sulfur compound, at least 15% of a film-forming polymer, and water, and an ink containing a dye
5 which can be reduced to colorless form by the reducing compound.

Preferred reducing sulfur compounds include sulfite salts, e.g., sodium sulfite. It is preferred that the eradicator fluid contain
10 at least about 0.5 weight percent and not more than about 4 weight percent of the sulfur compound. Lower levels of the compound will not effectively reduce the dye in the ink, while higher levels will cause the fluid to gel
15 rapidly and are difficult to dissolve. It is more preferred that the fluid contain from about 1 to 3 weight percent of the sulfur compound, with about 2 percent generally most preferred. Sulfite salts are commercially available from a
20 number of suppliers, e.g., photographic grade sodium sulfite may be obtained from Eastman Chemical Co. While sulfur compounds are preferred, other reducing agents can be used, such as basic nitrogen compounds, phosphite
25 salts and sodium carbonates.

Suitable film-forming polymers include those which dry quickly, when the eradicator fluid is applied in a thin film, to form a non-tacky water impermeable film. Such polymers
30 typically have a high rate of water release. Preferred polymers are acrylic polymers, more preferably polymethacrylates and polyacrylates. Preferred polymers are RHOPLEX acrylate polymer emulsions, commercially available from Rohm &
35 Haas; a particularly preferred polymer is RHOPLEX AC-261. Other polymers which may be used include water-soluble salts of styrene

maleic anhydride copolymers, e.g., SMA resins, commercially available from ATOCHEM, and water-soluble acrylic resins available from S.C. Johnson. Preferably the polymer is provided in the form of an emulsion, or is a water-soluble salt, for ease in incorporating the polymer into the fluid. It is preferred that the eradicator fluid contain at least about 15 weight percent, and not more than about 40 weight percent of the polymer. At lower levels, a marking formed over the eradicator fluid will still tend to fade or disappear, while at higher levels (greater than about 40 percent) the fluid may coagulate or be excessively thick. More preferably, the fluid contains from about 20 to 30 weight percent of the polymer.

Preferred eradicator fluids contain sufficient water to provide a viscosity of from about 1 to 10 cps. The eradicating fluids typically contain from about 55 to 95 percent, more preferably 65 to 85 percent water.

The eradicator fluids can include other ingredients, such as bacteriocides and buffers.

The eradicator fluids generally can be prepared by blending the ingredients under conditions of moderate shear. It is preferred that the reducing agent be dissolved in part or all of the water, then any optional components, e.g., bacteriocide, added to the resulting solution, then the emulsion added last.

Suitable inks are those which contain dyes which can be reduced to colorless form by the selected reducing agent, i.e., when the reducing agent is a sulfur compound, dyes which can be reduced by the sulfur compound, for example triaryl methane dyestuffs. Combinations

of dyes and reducing agents which will allow the ink to be successfully eradicated can be easily determined by one skilled in the art. Preferred inks include solvent based ball point inks, such as those commercially available from Dokumental, W. Germany, under the tradename DOKUMENTAL R080 inks.

The preferred inks and eradicator fluids can be used in standard ball point pens, e.g. pens which include a tubular member for fluid communication with a reservoir (either a fiber or hollow reservoir); a socket, having a seat, at one end of the member; an interior wall surface extending from the seat; a rim disposed at the end of the interior wall surface opposite the seat; and a spherical ball that is disposed in the socket, rotatably engagable with the seat and captured by the rim.

Preferably, the preferred inks are supplied in conventional ball point pens, as described above, while the eradicator fluids are supplied in conventional capillary feed markers that preferably include a polyolefin fiber tip (or nib) connected to a reservoir, preferably also made of polyester fiber. Other types of nibs, e.g., acrylic fibers, may be used.

In one embodiment, the ink and the eradicator fluid are supplied in separate pens. If desired, several ink-containing pens may be provided, each pen containing an ink having a different color.

In another embodiment, the ink and the eradicator fluid are supplied in a single pen, containing a reservoir for each. Each reservoir may be either a hollow or fiber reservoir. The two reservoirs are surrounded by a tubular member, e.g., a polypropylene barrel. If the

pen is a marker, it includes nibs at opposite ends, each nib being covered by a cap. Alternatively, if it is a ball point pen it includes a ball and socket structure, as
5 described above and as is well known in the art, at each end. If desired, the pen may be a marker at one end, containing the eradicator fluid, and a ball point pen at the other end, containing the ink. Reservoirs are available
10 from, e.g., American Filtrona Co. of Richmond, VA, or Baumgartner, Germany. Nibs are available from e.g., Aubex Co. of Tokyo, Japan, Teibow or Porex.

The following example illustrates the
15 invention.

Example

An eradicator fluid was prepared by mixing 2 parts sodium sulfite, 3 parts triethanolamine (a stabilizer and pH adjuster),
20 0.1 part 2-chloroacetamide (a preservative), 50 parts of RHOPLEX AC-261 (a 50% solids emulsion of an acrylate polymer in water), and 50 parts deionized water. The fluid was applied to a dried marking formed with DOKUMENTAL R080 ball
25 point ink. The marking disappeared after about 1 second. About 10 seconds after the marking disappeared, a new, corrective marking was formed with the same ink over the eradicator fluid. This marking did not disappear.

30 Other embodiments are within the claims.



- 8 -

C L A I M S

1. An ink eradicator system comprising
an eradicator fluid comprising a
reducing sulfur compound, a film-forming polymer
5 and water, and
an ink comprising a colorant that is
capable of being reduced by the reducing agent.
2. An ink eradicator system comprising
an eradicator fluid that includes a
10 reducing agent, at least 8% of a film-forming
polymer, and water, and
an ink comprising a colorant that is
capable of being reduced by the reducing agent.
3. A system of claims 1 or 2, wherein the
15 film-forming polymer is an acrylic polymer.
4. A system of claim 3, wherein the
acrylic polymer is in the form of an emulsion.
5. A system of claim 3, wherein the
acrylic polymer is selected from the group
20 consisting of polymethacrylates, polyacrylates
and mixtures or copolymers thereof.
6. A system of claim 5, wherein the
acrylic polymer is a
butylacrylate/methylmethacrylate blend or
25 copolymer.
7. A system of claim 1 or 2, wherein the
eradicator fluid includes from about 0.5 to 4.0
weight percent reducing agent, from about 15 to
40 weight percent film-forming polymer, and from
30 about 55 to 95 weight percent water.
8. A system of claim 1, wherein said
sulfur compound is a sulfite salt.
9. A system of claim 1 or 2, wherein said
colorant is a dye.
- 35 10. A system of claim 1 or 2, wherein said
colorant is reduced to colorless form.
11. A system of claim 2, wherein said



reducing agent is a sulfite salt.

12. An eradicator fluid including a reducing sulfur compound, at least 8% by weight of a film-forming polymer, and water.

5 13. An eradicator fluid of claim 12, wherein the film-forming polymer is an acrylic polymer.

14. An eradicator fluid of claim 13, wherein the acrylic polymer is selected from the
10 group consisting of polymethacrylates, polyacrylates, and mixtures or copolymers thereof.

15. An eradicator fluid of claim 12, wherein the eradicator fluid includes from about
15 0.5 to 4.0 weight percent of said reducing sulfur compound, from about 15 to 40 weight percent of said film-forming polymer, and from about 55 to 95 weight percent water.

16. An eradicator fluid of claim 12, wherein said fluid comprises at least 15% by
20 weight of said film-forming polymer.

17. A pen for making and correcting markings, comprising
an elongated body having a tip at each
25 end,

a pair of reservoirs within the body, each reservoir extending from each tip towards the center of the pen,

one of the reservoirs containing an
30 eradicator fluid comprising a reducing agent, a film-forming polymer and water, and the other reservoir containing an ink comprising a colorant capable of being reduced by the reducing agent.

18. A pen of claim 17, wherein the film-forming polymer is an acrylic polymer.

19. A pen of claim 18, wherein the acrylic



polymer is selected from the group consisting of polymethacrylates, polyacrylates and mixtures thereof.

20. A pen of claim 18, wherein said
5 colorant is a dye.

21. A method of correcting an ink marking comprising the steps of:
making a marking with an ink containing a colorant capable of being reduced
10 to a colorless form; and

applying an eradicator fluid, containing a reducing agent which will reduce the colorant, at least 8% by weight of a film-forming polymer and water, to a portion of the
15 marking.

22. A method of claim 21, further comprising the step of applying a corrective ink marking to the portion of the marking which was eradicated by the eradicator fluid.

20 23. A method of claim 22, wherein the corrective ink marking may be applied within less than 20 seconds after the application of the eradicator fluid.

24. A pen system comprising
25 a first marking pen containing an eradicator fluid comprising a reducing agent, at least 8% of a film-forming polymer, and water, and

a ball point pen containing an ink
30 comprising a colorant that is capable of being reduced by the reducing agent of the invention.

25. A system of claim 24, wherein said ball point pen comprises a tubular member for fluid communication with a reservoir, a socket, having a seat, at one end of the member, an
35 interior wall surface extending from the seat, a rim disposed at the end of the interior wall



surface opposite the seat, and a spherical ball that is disposed in the socket, rotatably engagable with the seat and captured by the rim.

26. A system of claim 24, wherein said
5 system includes a plurality of ink-containing pens, each pen containing an ink having a different color.

27. A pen system for making and correcting markings, comprising
10 a first pen containing an eradicator fluid comprising a reducing agent, at least 8% of a film-forming polymer, and water, and
at least one pen containing an ink comprising a colorant that is capable of being
15 reduced by the reducing agent of the invention,
each said pen comprising an elongated body having a tip, and a reservoir within the body for containing the ink or eradicator fluid, said reservoir extending from the tip towards
20 the center of the pen.

28. A pen system for making and correcting markings, comprising
a first pen containing an eradicator fluid comprising a reducing agent, a film-
25 forming polymer, and water, and
a plurality of pens, each pen containing an ink comprising a colorant that is capable of being reduced by the reducing agent of the invention, each ink being of a different
30 color,

each said pen comprising an elongated body having a tip, and a reservoir within the body for containing the ink or eradicator fluid, said reservoir extending from the tip towards
35 the center of the pen.

29. A system of claim 1 or 2, wherein said film-forming polymer is a water-soluble salt of



- 12 -

a styrene maleic anhydride copolymer.

30. A system of claim 1 or 2, wherein said film-forming polymer is a water-soluble acrylic polymer.