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FILED BY

OCT 16 2003

**IN THE UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF TENNESSEE
EASTERN DIVISION**

**AFTER HOURS DEPOSITORY
Robert F. Di Troia, Clerk
U. S. DIST COURT
W. D. OF TN, MEMPHIS**

**PHILIP E. BOYNTON, CLARENCE)
W. BOYNTON, NORMA ANN)
LOGAN, RENELDA J. WESTFALL,)
SHANNON NONN, AARON SCOTT)
BERNARD, ALAN F. BERNARD,)
LINDA R. BERNARD, and)
DAVID ALAN BERNARD,)
Individually, and on behalf of)
An Unincorporated Association)
d/b/a "Adtech, Inc. of Illinois,")
on behalf of a General Partnership)
d/b/a "Adtech, Inc. of Illinois," and)
on Behalf of a Class of Similarly)
Situated Persons,)**

Plaintiffs,

vs.

**HEADWATERS, INC.,)
f/k/a Covol Technologies, Inc.,)
JAMES G. DAVIDSON,)
A. GRAYDON HOOVER, and)
Unnamed DOE DEFENDANTS 1-25,)**

Defendants.

**Case No. 1-02-1111
JUDGE McCALLA**

JURY DEMAND

FIRST AMENDED COMPLAINT

Plaintiffs bring this action to recover damages resulting from Defendants' conspiracy to deprive Plaintiffs of profits from a patented technology and related proprietary information.

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PARTIES

1. Plaintiff Philip E. Boynton is a citizen and resident of the State of Nevada. Plaintiffs, Clarence W. Boynton, Norma Ann Logan, Renelda J. Westfall, Shannon Nonn, Aaron Scott Bernard, David Alan Bernard, Alan F. Bernard, and Linda R. Bernard are citizens and residents of the State of California.

2. Defendant James G. Davidson is a citizen and resident of the State of Tennessee, residing in this judicial district.

3. Defendant A. Graydon Hoover is a citizen and resident of the State of Tennessee, residing in this judicial district.

4. Defendant Headwaters, Inc. is a Delaware corporation, formerly known as Covol Technologies, Inc. ("Covol"), having its principal place of business in the State of Utah.

5. The unnamed Doe Defendants 1-25 are, on information and belief, individuals who participated in, and are therefore liable for, the actions described in this complaint. The Named Plaintiffs reserve the right to amend this Complaint to identify such defendants and cause process to be served on them.

JURISDICTION AND VENUE

6. This Court has subject matter jurisdiction over this matter pursuant to 28 U.S.C. § 1332, based on diversity of citizenship.

7. Venue is proper before this Court because a substantial portion of the acts and transactions on which the claims are based occurred in Paris, Tennessee.

8. This Court has personal jurisdiction over Defendants Mr. Davidson, and Mr. Hoover because they are citizens and residents of Tennessee. This Court has personal jurisdiction over the Defendant Covol and the unnamed Doe Defendants, pursuant to the long-arm jurisdiction of this Court because the transactions which form the basis of this complaint occurred in whole or in part within the State of Tennessee and because the causes of action asserted in this complaint arose within the State of Tennessee.

BACKGROUND FACTS

9. Beginning in the late 1980's, the plaintiffs identified in Paragraph 1 above (the "Named Plaintiffs"), invested in and became shareholders in an Illinois corporation known as Adtech, Inc. of Illinois" that was incorporated on November 23, 1987 (the "First Adtech").

10. The First Adtech was intended to be the legal entity for a joint business venture (the "Adtech venture") created for a single purpose, namely the development and commercialization of certain patented technology and related proprietary information relating to "agglomeration" (a process by which small particles of coal, rock or other materials are combined into larger pieces). This is a commercially useful process because, among other things, it permits various undesirable impurities in coal to be removed by reducing raw coal to small particles and then using the patented process to re-combine the small particles of coal into a larger, more usable state.

11. At the same time as the Named Plaintiffs became shareholders, and over a period of years thereafter, other persons joined the Adtech venture by purchasing stock in the First Adtech and/or by purchasing what they believed was stock in the First Adtech. A list of the investors (or their designees or successors in interests) and their respective percentage interests in the Adtech venture is attached as Exhibit A to this Complaint. This list includes relatives of the defendant, Mr. Davidson, who did not invest money into the Adtech venture but was entitled to a share of the investment as a result of his work in developing the patented technology and elected to have his share held in the name of other members of his family.

12. The Named Plaintiffs are similarly situated with the other persons identified on Exhibit A for the purposes of Fed. R. Civ. Proc. 23(a) and 23.2 and can fairly and adequately represent the interests of such other persons as a class or as an unincorporated association, as the Court may determine. Alternatively, the Named Plaintiffs can fairly and adequately represent the interests of such other investors, excluding those who participated with Mr. Davidson, were aware the events described prior to the time the Named Plaintiffs learned of them, or wish to opt out of this action.

13. Given the number of other investors, the requirement that this action be filed on short notice, and the fact that several of the investors are either relatives of the Defendant Mr. Davidson or aligned with him, it is impracticable to join all such persons as plaintiffs in this action. There are questions of law and fact that are common to the entire group of persons identified on Exhibit A and the claims of the Named Plaintiffs are typical of the claims of the entire class.

14. To the extent this Court determines that the Named Plaintiffs and those persons identified on Exhibit A constitute a general partnership, then the Named Plaintiffs are general partners of such partnership and bring this action on behalf of and in the name of such partnership.

15. The Defendant Mr. Davidson was responsible for overseeing the operations of the Adtech venture, located in Paris, Tennessee, for which he was compensated out of funds invested and income generated by the Adtech venture.

16. On August 24, 1993, the technology was patented by U.S. Patent No. 5,238,629 (the "Patent"). The Patent was obtained in the name of Mr. Davidson, as "Inventor" and had previously been assigned to the First Adtech by Mr. Davidson pursuant to an assignment dated July 29, 1991. The consideration for the assignment was \$10,000, which was paid to Mr. Davidson from funds invested by the Named Plaintiffs and/or other investors, together with the shares in the First Adtech issued at Mr. Davidson's direction to his family members. A copy of the July 29, 1991, assignment is attached as Exhibit B to this Complaint. A copy of the Patent, which also reflects the assignment on its face, is attached as Exhibit C.

17. In addition to the Patent, the Adtech venture developed certain valuable proprietary information related to the Patent. This proprietary information was valuable in and of itself and also increased the value of the patented technology and, therefore, the Patent.

18. From 1991 through 1998, the Adtech venture operated as the First Adtech. After 1993, the Adtech venture earned income from the commercialization of the Patent and related proprietary information.

19. Mr. Davidson, with the assistance of one or more of the unnamed Doe Defendants, diverted some or all of this income from the Adtech venture to his own benefit, and on information and belief the benefit of one or more of the unnamed Doe Defendants, at the expense of the Named Plaintiffs and the other investors.

20. Then, beginning in 1998, in combination with the other Defendants, Mr. Davidson engaged in a scheme to defraud the Named Plaintiffs and the other investors. Specifically, Mr. Davidson secretly negotiated and purported to sell the rights to the Patent and related proprietary information to the Defendant Covol.

21. Mr. Davidson sold, or purported to sell, the Patent and related proprietary information to Covol for the purpose of benefitting Covol, Mr. Davidson and the other Defendants at the expense of the Named Plaintiffs and the other investors.

22. In order to accomplish his scheme, Mr. Davidson engaged in various actions, including the following:

(A) Mr. Davidson secretly caused a new Illinois corporation to be incorporated on May 14, 1998, known as "Adtech, Inc. of Illinois" (the "Second Adtech"). This was the identical name as the First Adtech and was incorporated by Mr. Davidson because the Patent and other valuable rights

were in the name of the First Adtech, which had been dissolved, and Mr. Davidson needed to execute documents that appeared to be authorized by the First Adtech.

(B) Mr. Davidson negotiated with the Defendant Covol without disclosing the negotiations to the Named Plaintiffs or the other investors (apart from Mr. Davidson and possible other investors aligned with him), despite having a legal obligation to do so as a result of his position running the business.

(C) Mr. Davidson entered into contracts with the Defendant Covol without first disclosing these to or obtaining the consent of the Named Plaintiffs or the other investors. Mr. Davidson entered into several agreements with Covol, some of which benefitted him directly.

(D) Mr. Davidson diverted money and/or property paid by Covol for the Patent to his own individual benefit.

23. The Defendant Covol participated in the common scheme in various ways, including the following:

(A) Covol agreed to purchase rights to the Patent and related proprietary information in a manner deliberately calculated to permit Mr. Davidson to purport to enter into the transaction on behalf of the First

Adtech, without informing or obtaining the consent of the Named Plaintiffs or the other investors (apart from Mr. Davidson).

(B) Covol executed documents which Covol knew did not accurately reflect the transactions being consummated.

(C) Covol concealed the fraud once the Named Plaintiffs and the other investors discovered what had happened.

The Defendant Covol engaged in this conduct through the actions of various officers, employees and other agents whose actions were all within the course and scope of their office, employment or agency and whose actions were then later ratified by Covol. The Named Plaintiffs reserve the right to amend this Complaint to identify one or more of such persons as Doe Defendants.

24. The Defendant Mr. Hoover provided bookkeeping, accounting and other services to the Adtech venture for which he was compensated by the Adtech venture. Mr. Hoover also participated in the common scheme in various ways, including the following:

(A) Mr. Hoover assisted Mr. Davidson in structuring, negotiating and completing the transaction despite Mr. Hoover's employment by and duties to the First Adtech and his responsibilities to the Named Plaintiffs and the other investors.

(B) Mr. Hoover served as incorporator of the Second Adtech at Mr. Davidson's request.

(C) Mr. Hoover concealed the fraud once the Named Plaintiffs and the other investors discovered what had happened.

25. Other unnamed Doe Defendants assisted Mr. Davidson and Covol in this scheme in various ways, including:

(A) On information and belief, one or more of the unnamed Doe Defendants advised and assisted Mr. Davidson in structuring the transaction in a manner calculated to effectuate the fraud upon the Named Plaintiffs and the other investors.

(B) On information and belief, one or more of the unnamed Doe Defendants agreed to serve as officers and directors of the Second Adtech for the purpose of purporting to ratify the transactions, with knowledge that their actions were intended to defraud the Named Plaintiffs and the other investors.

(C) On information and belief, one or more of the unnamed Doe Defendants advised and assisted Covol in structuring the transaction in a manner calculated to effectuate the fraud upon the Named Plaintiffs and the other investors.

(D) On information and belief, one or more of the unnamed Doe Defendants caused Covol to participate in the transactions with knowledge that the transactions were intended to defraud the Named Plaintiffs and the other investors.

26. The Named Plaintiffs and the other investors suffered damages as a result of the actions of the Defendants. These damages include the loss of past and future income from commercialization of the Patent and related proprietary information. The damages also include lost profits caused by Covol's intentional failure to commercialize the Patent in order to benefit other, competing technologies owned by Covol, the profitability of which would be lessened by commercialization of the Patent. The amount of these damages will be proven at trial, but is estimated to be at least \$10 million if calculated for the entire group of investors as a whole.

27. On or about May 13, 1999, or sometime thereafter, the Named Plaintiffs first learned of the October 1998 transaction entered into by Mr. Davidson and Covol. Prior to May 4, 1999, at the latest, none of the Named Plaintiffs or the other investors on whose behalf this lawsuit is brought (other than those related to or assisting Mr. Davidson) knew or reasonably could have known of the sale. On or about May 25, 1999, by means of a "Report to

Shareholders” sent to the Named Plaintiffs and the other investors, Mr. Davidson finally disclosed to the investors that he had purported to sell the rights to the Patent in 1998.

28. On August 21, 2000, the Named Plaintiffs and several of the other investors caused an action to be brought styled *Adtech, Inc. of Illinois v. James G. Davidson and Covol Technologies, Inc.*, Case No. 1-00-1244, U.S. District Court, Western District of Tennessee (the “Adtech Federal Action”). The Adtech Federal Action sought damages from Mr. Davidson and Covol for their conduct in purporting to transfer rights to the Patent to Covol and for patent infringement.

29. By Order entered August 28, 2001, the U.S. District Court for the Western District of Tennessee, Eastern Division, dismissed the Adtech Federal Action for lack of subject matter jurisdiction on various grounds asserted by Mr. Davidson and/or Covol including the following:

(A) The First Adtech and the Second Adtech are separate corporations.

(B) The purported August 24, 1991, assignment of the Patent to the First Adtech was not effective to transfer rights to the Patent to the First Adtech, because its corporate existence had been terminated by that date as a result of the administrative dissolution on April 1, 1991.

(C) The Second Adtech never acquired any rights to the Patent.

The Defendants in this action are estopped from denying the grounds set forth in the Order, including those set forth above, dismissing the Adtech Federal Action by the principles of judicial estoppel as well as issue preclusion or collateral estoppel.

30. Upon the dismissal of the Adtech Federal Action, the Named Plaintiffs learned for the first time that the damages caused by the Defendants' actions were suffered by the Named Plaintiffs and the other persons identified on Exhibit A in their individual capacities, rather than as shareholders of the First Adtech and/or the Second Adtech.

COUNT I

(Fraud and Civil Conspiracy)

(All Defendants)

31. Plaintiffs incorporate by reference the allegations contained in Paragraphs 1 through 30 above.

32. All of the Defendants combined for the purpose of accomplishing by concert a common scheme, the object of which was to deprive the Named Plaintiffs and the other investors (apart from Mr. Davidson) of profits they were

legally entitled to receive from the commercialization of the Patent and related proprietary information.

33. The Defendants acted in concert for the purpose of completing the transactions which purported to transfer title to the Patent and related proprietary information to the Defendant Covol at the expense of the Named Plaintiffs and the other investors (apart from Mr. Davidson).

34. Each of the Defendants engaged in one or more overt actions in furtherance of this common scheme. Examples of overt actions include, but are not limited to the following:

(A) Mr. Davidson, without the knowledge or consent of the Named Plaintiffs or the other investors (apart from Mr. Davidson), purported to sell rights to the Patent and related proprietary information to Covol in exchange for personal benefits. In order to accomplish this transaction, Mr. Davidson secretly cause the Second Adtech to be incorporated with the identical name as the previously dissolved First Adtech, in order to permit a plausible chain of title to be reflected in the sale documents. Mr. Davidson also failed to disclose the transaction to the Named Plaintiffs and the other investors (apart from Mr. Davidson), despite having a duty to do so. Mr. Davidson also knowingly purported to convey rights to the Patent without the consent

of the Named Plaintiffs and the other investors (apart from Mr. Davidson), despite knowing that the Named Plaintiffs and the other investors had a beneficial interest in the Patent and related proprietary information.

(B) The Defendant Covol negotiated with Mr. Davidson, purchased or purported to purchase rights to the Patent and related proprietary information, structuring a transaction in a manner that would prevent the Named Plaintiffs or the other investors (other than Mr. Davidson) from learning about the fraudulent transaction until after it had been consummated. Covol also executed documents it knew did not accurately reflect the transactions and agreed to accept title to the Patent based on a chain of title that it knew to be defective and which it would not have accepted in a normal business transaction. The Defendant Covol accepted title to the Patent and received income from the commercialization of the Patent and related proprietary information, despite knowing that the Named Plaintiffs and the other investors had a beneficial interest in the Patent and related proprietary information.

(C) The Defendant Mr. Hoover served as incorporator of the Second Adtech. On information and belief, the Defendant Mr. Hoover provided advice and assistance to Mr. Davidson in structuring and closing

the fraudulent transactions and in concealing the fraud after the fact when the Named Plaintiffs and the other investors complained. Mr. Hoover's actions constituted a breach of his obligations to the Named Plaintiffs and the other investors.

(D) On information and belief, one or more of the unnamed Doe Defendants actively assisted Mr. Davidson in various ways in negotiating, preparing, closing ratifying, and/or concealing the transaction, with knowledge that the actions of the unnamed Doe Defendants was assisting Mr. Davidson in defrauding the Named Plaintiffs and others.

(E) On information and belief, one or more of the unnamed Doe Defendants acted on behalf of and/or actively assisted Covol in various ways in negotiating, preparing, closing ratifying, and/or concealing the transaction, with knowledge that the actions of the unnamed Doe Defendants was assisting Mr. Davidson in defrauding the Named Plaintiffs and others.

Because the Defendants and unnamed Doe Defendants participated in this scheme as co-conspirators, each is chargeable with the frauds committed by others in furtherance of the conspiracy.

35. As a result of the fraud and civil conspiracy described above, the Named Plaintiffs and the other investors suffered damage including the loss of past and future profits from the commercialization of the Patent and related proprietary information.

36. In connection with this fraud and civil conspiracy, the Defendants each acted intentionally, fraudulently, maliciously and/or recklessly, justifying an award of punitive damages.

COUNT II

(Constructive and/or Resulting Trust)

(Defendant Mr. Davidson)

37. Plaintiffs incorporate by reference the allegations contained in Paragraphs 1 through 36 above.

38. As a result of the July 29, 1991, assignment (Exhibit B) being ineffective, Mr. Davidson held title to the Patent and related proprietary information under circumstances justifying the imposition of a constructive and/or resulting trust for the benefit of the Named Plaintiffs and the other investors.

39. Alternatively, whatever rights to the Patent or related proprietary information Mr. Davidson acquired after July 29, 1991, were obtained in breach of

Mr. Davidson's legal duties to the Named Plaintiffs and the other investors and with knowledge that these other persons were entitled to the benefits from commercialization of the Patent and related proprietary information. Accordingly, Mr. Davidson acquired such rights under circumstances justifying the imposition of a constructive and/or resulting trust.

40. The terms of the trust(s) described in Paragraphs 38 and 39 above are that the Named Plaintiffs and the other investors share in the ownership and profits from the commercialization of the Patent and related proprietary information in the percentages they had agreed and believed themselves to be shareholders of the First Adtech, which are reflected on the attached Exhibit A.

COUNT III

(Imposition of Constructive Trust)

(Defendant Covol)

41. Plaintiffs incorporate by reference the allegations contained in Paragraphs 1 through 40 above.

42. When Covol purchased, or purported to purchase, rights to the Patent and related proprietary information on November 10, 1998, it did so knowing of the rights of the Named Plaintiffs and the other investors.

43. As a result, the Named Plaintiffs and the other investors are entitled to the imposition of a constructive trust with respect to the rights in the Patent or related proprietary information Covol acquired in the transaction.

COUNT IV

(Conversion)

(Defendants Covol and Mr. Davidson)

44. Plaintiffs incorporate by reference the allegations contained in Paragraphs 1 through 43 above.

45. The Named Plaintiffs and the other investors were the beneficial owners of the Patent and related proprietary information.

46. The actions of the Defendants Mr. Davidson and Covol constituted conversion of this property.

47. In connection with this conversion, the Defendants Mr. Davidson and Covol each acted intentionally, fraudulently, maliciously and/or recklessly, justifying an award of punitive damages.

COUNT V

(Breach of Contract)

(Defendant Mr. Davidson and Doe Defendants)

48. Plaintiffs incorporate by reference the allegations contained in Paragraphs 1 through 47 above.

49. Following the dissolution of the First Adtech on April 1, 1991, the Named Plaintiffs and the other investors continued to operate the common Adtech venture seeking to commercialize the Patent and related proprietary information.

50. Mr. Davidson was named a "Director" of this business and undertook to run the business, acting on behalf of the entire group, however it might properly be classified as a legal entity. Mr. Davidson later assumed the position of "President" of the Adtech venture.

51. The relationship between Mr. Davidson, on the one hand, and the Named Plaintiffs and the other investors, on the other hand, resulted in the creation of various express and/or implied contracts, the terms of which mirrored the expectations of the parties given their belief that the business was being conducted as a corporation, whether as the First Adtech or later as the Second Adtech. A copy of the Bylaws of the First Adtech is attached as Exhibit D. These

Bylaws set forth some of the expectations of the parties with respect to Mr.

Davidson's responsibilities and limitations on his authority.

52. One or more of the unnamed Doe Defendants had similar contractual obligations to the Named Plaintiffs and other investors as a result of the unnamed Doe Defendants undertaking to act on behalf of the Adtech venture.

53. Mr. Davidson's actions in diverting profits from the commercialization of the Patent and related proprietary information constituted a breach of his contractual obligations.

54. Mr. Davidson's actions in selling or purporting to sell the rights to the Patent and related proprietary information to Covol constituted a breach of his contractual obligations.

55. Mr. Davidson's actions in disclosing the proprietary information to Covol was a breach of his contractual obligations.

56. On information and belief, one or more of the unnamed Doe Defendants breached their contractual obligations to the Named Plaintiffs and others by assisting Mr. Davidson in the diversion of profits from the commercialization of the Patent and related proprietary information prior to the purported sale to Covol and by failing to disclose this diversion to the Named Plaintiffs and other investors.

57. On information and belief, one or more of the unnamed Doe Defendants also breached their contractual obligations to the Named Plaintiffs and others by assisting Mr. Davidson in the fraudulent transactions and by failing to disclose the transactions to the Named Plaintiffs and other investors.

58. On information and belief, one or more of the unnamed Doe Defendants also breached their contractual obligations to the Named Plaintiffs and others by disclosing proprietary information to Covol.

59. The Named Plaintiffs and the other investors were damaged as a result of these breaches by the loss of past and future income from the commercialization of the Patent and related proprietary information.

COUNT VI

(Interference with Contract)

(Defendant Covol and Doe Defendants)

60. Plaintiffs incorporate by reference the allegations contained in Paragraphs 1 through 59 above.

61. The Defendant Covol knew that Mr. Davidson and the other unnamed Doe Defendants affiliated with the Adtech venture had contractual obligations to the Named Plaintiffs and the other investors.

62. On information and belief, one or more of the unnamed Doe Defendants affiliated with Covol, knew that Mr. Davidson and the other unnamed Doe Defendants affiliated with the Adtech venture had contractual obligations to the Named Plaintiffs and the other investors.

63. The Defendant Covol induced Mr. Davidson and the unnamed Doe Defendants affiliated with the Adtech venture to breach their contractual obligations to the Named Plaintiffs and the other investors, by selling or purporting to sell the Patent and related proprietary information to Covol.

64. On information and belief, one or more of the unnamed Doe Defendants affiliated with Covol, induced Mr. Davidson and the unnamed Doe Defendants affiliated with the Adtech venture to breach their contractual obligations to the Named Plaintiffs and the other investors, by selling or purporting to sell the Patent and related proprietary information to Covol.

65. In inducing Mr. Davidson and the unnamed Doe Defendants affiliated with the Adtech venture to breach their contractual obligations, the Defendant Covol acted maliciously and without justification, being motivated to divert profits from the commercialization of the Patent and the related proprietary information to Covol at the expense of the Named Plaintiffs and the other investors.

66. On information and belief, in inducing Mr. Davidson and the unnamed Doe Defendants affiliated with the Adtech venture to breach their contractual obligations, the unnamed Doe Defendants affiliated with Covol acted maliciously and without justification, being motivated to divert profits from the commercialization of the Patent and the related proprietary information to Covol at the expense of the Named Plaintiffs and the other investors.

COUNT VII

(Breach of Fiduciary Duty)

(Defendant Mr. Davidson and Doe Defendants)

67. Plaintiffs incorporate by reference the allegations contained in Paragraphs 1 through 66 above.

68. Mr. Davidson owed fiduciary duties to the Named Plaintiffs and the other investors. These fiduciary duties arose from Mr. Davidson's role as being responsible for the management and operations of the business, whether the correct legal description of that business is a corporation, a *de facto* corporation, a partnership, or an unincorporated association.

69. On information and belief, one or more of the unnamed Doe Defendants also owed fiduciary duties to the Named Plaintiffs and the other

investors arising from the role of such unnamed Doe Defendant(s) with the Adtech venture.

70. Mr. Davidson's conduct in selling or purporting to sell the Patent and related proprietary information to the Defendant Covol constitutes a breach of his fiduciary duties to the Named Plaintiffs and other investors.

71. Mr. Davidson's conduct in disclosing proprietary information related to the Patent to the Defendant Covol constitutes a breach of his fiduciary duties to the Named Plaintiffs and the other investors (apart from Mr. Davidson).

72. On information and belief, the conduct of one or more of the unnamed Doe Defendants in advising and assisting Mr. Davidson in selling or purporting to sell the Patent and related proprietary information to Covol and/or disclosing proprietary information to Covol constitutes a breach of the fiduciary duties owed by such unnamed Doe Defendant(s) to the Named Plaintiffs and other investors.

73. In connection with his breaches of fiduciary duty, Mr. Davidson and the unnamed Doe Defendant(s) acted intentionally, fraudulently, maliciously and/or recklessly, justifying an award of punitive damages.

JURY DEMAND

Pursuant to Fed. R. Civ. Proc. 38(b), the Plaintiffs, individually and in their representative capacities, respectfully demand a trial by jury of any issue triable of right by a jury.

PRAYER FOR RELIEF

THEREFORE, in light of the foregoing, Plaintiffs, individually and in their representative capacities, respectfully request the following relief:

1. Entry of an Order pursuant to Fed. R. Civ. Proc. 23(c)(a) certifying this as a class action;
2. Entry of an appropriate Order pursuant to Fed. R. Civ. Proc. 23.2 certifying this as an action on behalf of an unincorporated association and declaring the members of such association and their respective interests in the association;
3. Judgment in favor of Plaintiffs against the Defendants jointly and severally for compensatory damages in an amount to be shown at trial, but estimated at this time to be at least \$10,000,000;
4. Judgment in favor of Plaintiffs against each Defendant severally for punitive damages in an amount warranted by the proof at trial;

5. Judgment in favor of Plaintiffs against Defendant Covol for treble damages pursuant to T.C.A. § 47-50-109;

6. Entry of an Order declaring the respective rights and relationships of the Plaintiffs and the other investors, as an unincorporated association, a partnership, or other business entity, and further setting forth the constituents of such business entity;

7. Entry of an appropriate Order divesting James G. Davidson and Headwaters, Inc. of any and all rights in and declaring that all rights to Patent No. 5,238,629 are vested in Plaintiffs as an unincorporated association, partnership, or other business entity;

8. Judgment in favor of Plaintiffs for costs, including discretionary costs and reasonable attorneys fees; and

9. Such other relief as may be just.

Dated: October 16, 2003.

Respectfully submitted,



JEFFREY A. GREENE

(Tenn. Bar No. 10972)

113 29th Avenue, South

P.O. Box 120538

Nashville, Tennessee 37212-0538

Tel: (615) 460-0037

Fax: (615) 460-9776

Attorney for Plaintiffs

CERTIFICATE OF SERVICE

I certify that a copy of the foregoing has been served on:

Brian L. Davis
919 Ferncliff Cove, Suite 1
Southaven, MS 38671

Edwin E. Wallis, Jr.
325 N. Parkway
P.O. Box 3897
Jackson, TN 38303

Larry R. Laycock
WORKMAN, NYDEGGER & SEELEY
1000 Eagle Gate Tower
60 E. South Temple
Salt Lake City, Utah 84111

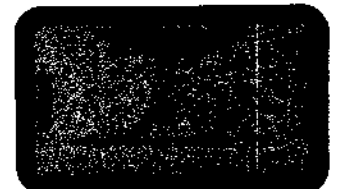
by first class mail on October 16, 2003.



Jeffrey A. Greene

EXHIBIT A

<u>Investor</u>	<u>Percentage Interest</u>	
James and Martha Fritz	5,000/467,743	(1.07%)
B. O'Neill Wyss	10,000/467,743	(2.14%)
Aaron Scott Bernard	5,000/467,743	(1.07%)
David Alan Bernard	5,477/467,743	(1.17%)
Arthur and Mary Johnson	5,477/467,743	(1.17%)
Paul and Virginia Beecroft	5,000/467,743	(1.07%)
Wyss Family Trust	10,000/467,743	(2.14%)
Doris Boynton	100/467,743	(.02%)
Gary and Mary Niemczyk	4,382/467,743	(0.94%)
Robert Austin	6,847/467,743	(1.46%)
Dennis Ryll	12,500/467,743	(2.67%)
Richard Boynton	4,382/467,743	(0.94%)
Clarence Boynton	4,382/467,743	(0.94%)
Renelda Westfall	4,382/467,743	(0.94%)
Joseph D. and Norma A. Logan	4,382/467,743	(0.94%)
Susan Delak	13,500/467,743	(2.89%)
Gloria A. Krause	5,000/467,743	(1.07%)
Alan and Linda Bernard	5,477/467,743	(.55%)
J.A. Higgins Trust and R.C. Moffat Family Trust	5,000/467,743	(1.07%)



Daniel Davidson	5,000/467,743	(1.07%)
Don Davidson	5,000/467,743	(1.07%)
David Davidson	5,000/467,743	(1.07%)
Diane DeStephen	5,000/467,743	(1.07%)
Mary Ann Davidson	50,000/467,743	(10.69%)
June Davidson	5/467,743	(.001%)
Janice I. Musser	250/467,743	(.053%)
Jerry W. Frye	1,000/467,743	(0.21%)
Evelyn I. Copenhaver	1,000/467,743	(0.21%)
Robert W. Copenhaver	1,000/467,743	(0.21%)
Terry P. and Donna T. Irvin	500/467,743	(0.11%)
Robert or Dona Hastie	100/467,743	(.02%)
Fred G. or Sherry Denny	250/467,743	(.053%)
Mark Hastie	250/467,743	(.053%)
Donald or Bonnie Hastie	250/467,743	(.053%)
Jeanne Bernard	5,000/467,743	(1.07%)
Tara Neargarder	5,000/467,743	(1.07%)
Philip H. Sawyer	5,000/467,743	(1.07%)
Steven R. Sawyer	5,000/467,743	(1.07%)
Kendra M. Neargarder Trust	5,000/467,743	(1.07%)
William O. Nolen	2,500/467,743	(0.53%)
Timothy A. Hagar	1,000/467,743	(0.21%)

Jerry or Geraldine Turner	250/467,743	(.053%)
William A. Beattie	3,750/467,743	(0.80%)
Joyce Mangum	1,000/467,743	(0.21%)
Kenneth or Vicky M. Bettendorf	500/467,743	(0.11%)
Douglas W. Essary	500/467,743	(0.11%)
Charles W. or Doreen J. Denson	500/467,743	(0.11%)
Richard C. Lane	500/467,743	(0.11%)
Rodney C. Eckert	500/467,743	(0.11%)
Tom or Ruth Pruett Patton	15,000/467,743	(3.21%)
Ruth Pruett Patton	15,000/467,743	(3.21%)
Samuel or Sheila Hines	1,500/467,743	(0.32%)
Albert "Huck" Buchanan	1,500/467,743	(0.32%)
Gayle P. Holmes	750/467,743	(0.16%)
James or Pat Silsbee	3,000/467,743	(0.64%)
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April R. Hagar	500/467,743	(0.11%)
Brad Hines	750/467,743	(0.16%)
Steve Selby	750/467,743	(0.16%)
Judy A. Irvin	200/467,743	(.043%)

Cassandra L. Wiese	100/467,743	(.02%)
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Roger Allen	500/467,743	(0.11%)
Jack P. or Marie C. Cook	500/467,743	(0.11%)
Hal W. or Lucinda Grayum	500/467,743	(0.11%)
Verona Trust	8,500/467,743	(1.82%)
Winston Duvall	500/467,743	(0.11%)
George P. George	500/467,743	(0.11%)
Ronald J. or Lana Hunking	500/467,743	(0.11%)
Elie Hayon	5,000/467,743	(1.07%)
Shannon Nonn	167,900/467,743	(35.9%)
Steven C. Boynton	5,000/467,743	(1.07%)
William P. McSherry or Bobette R., Trustees of the McSherry Living Trust	1,500/467,743	(0.32%)
Phillip E. Boynton	1,000/467,743	(0.21%)
James A. Allard	2,500/467,743	(0.53%)
Rebecca L. Allard	2,500/467,743	(0.53%)

PATENT APPLICATION TRANSMITTAL LETTER

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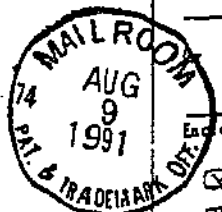
Transmitted herewith for filing is the patent application of

James G. Davidson

PROCESS AND PRODUCT OF COAL AGGLOMERATION

Enclosed are:

- 1 sheets of drawing
- an assignment of the invention to Adtech, Inc. of Illinois
- Disclosure Statement
- a certified copy of a _____ application.
- a power of attorney, & declaration
- verified statement to establish small entity status under 37 CFR 1.9 and 1.27.



CLAIMS AS FILED

SMALL ENTITY

OTHER THAN A SMALL ENTITY

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TOTAL CLAIMS	21 -20 -	1
INDEP CLAIMS	2 -3 -	0
MULTIPLE DEPENDENT CLAIM PRESENT		

RATE	FEE
	\$315
x 10 =	\$ 10
x 30 =	\$ 0
+ 100 =	\$
TOTAL	\$ 325

OR	RATE	FEE
OR		\$ 630
OR	x 20 =	\$
OR	x 60 =	\$
OR	+200 =	\$
OR	TOTAL	\$

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A S S I G N M E N T

WHEREAS, James G. Davidson

residing at Route 3 - Box 118C Paul Drive, Paris, Tennessee 38242

(hereinafter "Assignor") has invented certain new and useful improvements in PROCESS AND PRODUCT OF COAL AGGLOMERATION

for a full description of which reference is here made to an application for Letters Patent of the United States of America executed by Assignor as of the dates associated with his name herein; and

WHEREAS, Adtech, Inc. of Illinois
a corporation of the State of Illinois, having
its principal office and place of business in the City of Marion,
County of Williamson, State of Illinois
, (hereinafter "Assignee") is desirous of
acquiring the entire right, title, and interest in, to, and
under said invention and application above-identified, and in
and under any Letters Patent that may be obtained for said
invention, together with all foreign rights corresponding thereto,
as hereinafter more fully set forth.

FILED IN MAR 24 9

NOW, THEREFORE, TO ALL WHOM IT MAY CONCERN, Be it known that, for and in consideration of the sum of One Dollar (\$1.00), and other valuable and legally sufficient consideration, the receipt of which by Assignor from Assignee is hereby acknowledged, Assignor has agreed to sell, assign, and transfer and by these presents does hereby sell, assign, and transfer unto Assignee the entire right, title, and interest in, to, and under: said invention and application above identified; any Letters Patent of the United States of America that may be obtained in respect thereof; any corresponding applications for Letters Patent and Letters Patent therefor in all other areas of the world; and any reissues, extensions, substitutions, confirmations, divisions, and continuations of any of the foregoing (hereinafter "Invention Rights"), to have and to hold for the sole and exclusive use and benefit of Assignee forever.

Assignor hereby covenants and agrees, for himself and for his respective legal representatives, to assist and cooperate with Assignee in the preparation and prosecution of any applications included within the Invention Rights and in the prosecution or defense of any interference, opposition, or other proceeding that may arise in connection with any applications or Letters Patent included within the Invention Rights and further to execute and deliver to Assignee any and all additional papers that may be requested by Assignee for the purpose of implementing the terms of this ASSIGNMENT.

Assignor hereby authorizes and empowers Assignee to invoke and claim for any applications or Letters Patent included within the Invention Rights the benefit of any rights to which Assignor might be entitled under international law or under the laws of any particular country (such as, without limitation, the right of priority provided by the International Convention for the Protection of Industrial Property, as amended) and to invoke and claim such rights without further written or oral authorization from Assignor.

Assignor hereby consents that a copy of this ASSIGNMENT shall be deemed a full legal and formal equivalent of any assignment.

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*Has received an application for a patent
for a new and useful invention. The title
and description of the invention are en-
closed. The requirements of law have
been complied with, and it has been de-
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Therefore, this

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Matthew A. Thompson
Attest





US005238629A

United States Patent [19]

[11] **Patent Number:** 5,238,629

Davidson

[45] **Date of Patent:** Aug. 24, 1993

- [54] **PROCESS OF COAL AGGLOMERATION**
- [75] **Inventor:** James G. Davidson, Paris, Tenn.
- [73] **Assignee:** Adtech, Inc. of Illinois, Marion, Ill.
- [21] **Appl. No.:** 743,456
- [22] **Filed:** Aug. 9, 1991
- [51] **Int. Cl.:** C10L 5/06
- [52] **U.S. Cl.:** 264/123; 44/550; 44/556; 44/596; 264/37
- [58] **Field of Search:** 264/109, 117, 123, 37; 23/314, 313 R; 44/550, 551, 556, 593, 594, 596, 599

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Primary Examiner—Mary L. Theisen
Attorney, Agent, or Firm—Waters & Morse

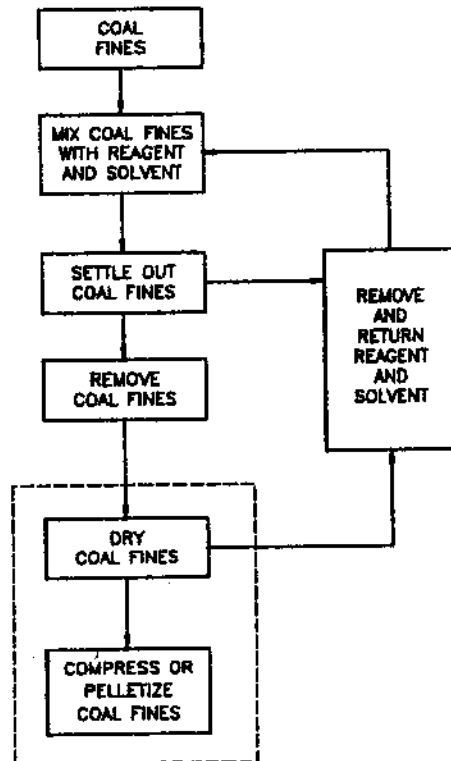
[57] **ABSTRACT**

A process for the agglomeration of coal fines comprises the steps of mixing the coal fines with an agglomerating liquid which is further comprised of a reagent and a solvent portion. The coal fines are thereafter separated from the agglomerating liquid, dried, and preferentially compressed into pellet form. The process also entails the recovery and return of the agglomerating liquid. The agglomerating liquid of the present invention includes the reagent portion which is a member or a combination of the group consisting of aromatic tertiary amines, nonaromatic cyclic amines or primary organic amines. The solvent is an organic solvent, desirably a member or a combination of the group consisting of toluene, chloroform, carbon disulfide or dimethylacetamide. The pellet formed from the process of the present invention is uniquely water resistant and of controllable hardness.

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19 Claims, 1 Drawing Sheet



U.S. Patent

Aug. 24, 1993

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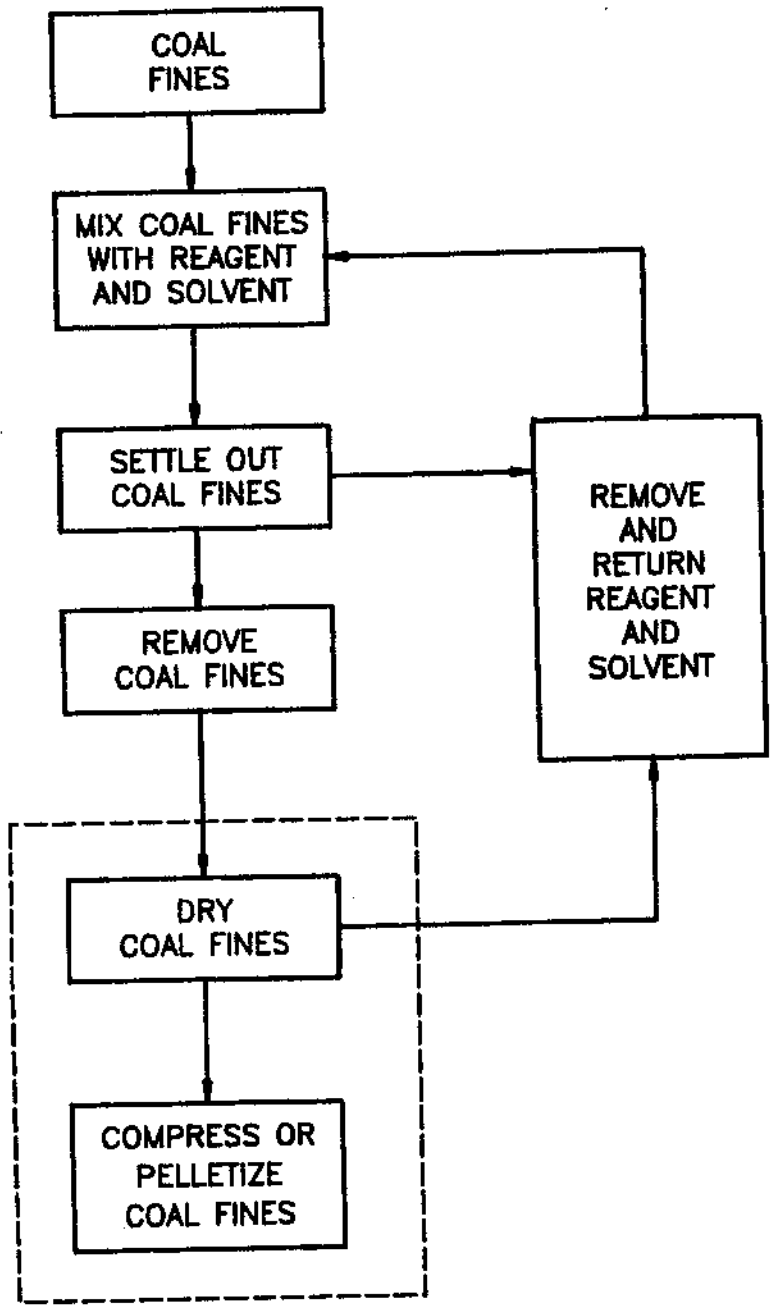


FIG. 1

PROCESS OF COAL AGGLOMERATION

BACKGROUND OF THE INVENTION

The present invention relates to the field of coal processing. More specifically, the invention relates to the recovery of coal fines which are traditionally regarded as waste by-products of various coal processes or coal handling.

The generation of coal fines during the processing of coals and while coal products are being transported has long been an industry problem. The tendency for coal and related products to randomly fracture into particles has never been successfully regulated such that grinding processes result in a wide distribution of particle sizes. Similarly, the transport or handling of coals has the effect of inducing contact between larger pieces and results in the creation of fines.

The typical methods for handling these fines usually depend on systems customized for coal fines. Thus in those facilities where fines are being generated routinely, many are handled through slurry or hopper systems and are directed to settling ponds. The accumulations in these ponds are dealt with en masse. In the transport of coals, the fines will fall to the bottom of the transport container. In cases such as ship transport, the level of fines accumulating in the bottom of the hold can lead to conditions where spontaneous combustion can take place. This feature of waterborne shipments of coal has led to sensitivity in the duration of shipments and as to the type and design of the vessel carrying the coal.

Recognition of the value of coal fines as an energy and chemical resource is long standing. The difficulty to date has been the poor economics involved in reprocessing the fines to a usable state or the lack of compatible and consistent outlets for coal fine consumption. The present invention has been successful in producing a usable coal product from coal fines while maintaining an economic advantage.

Other processes are known where coal fines are subjected to various conditions, typically high heats and/or pressure, and then are mechanically compressed or formed into pellets or briquettes. These processes are suited to low throughputs or batch operations and have energy or equipment requirements that make them unattractive for most of the situations described above.

One process is known where the coal fines are subjected to solvents that cause a partial and selective organic extraction to occur. The coal fines used in this process are preferentially those with paraffin content such that the relatively sticky compounds trapped in the coal matrix are brought to the surface of the coal particles. In this manner the particles are made to stick to each other and create clusters or clumps. Obvious drawbacks to this process include the required restriction of applying the solvents to certain coals. Most coal fines generated would not possess the requisite constituents for this process.

A need for a low cost method for the recovery and handling of coal fines has remained until the development of the present invention. As such it is at least one object of the present invention to provide a method for agglomerating coal fines as generated from many different sources. In addition, the method has significant economic advantages over past attempts in this field in that little energy input is required and much of the process chemistry is recycled.

SUMMARY OF THE INVENTION

A process for the agglomeration of coal fines comprises collecting coal fines of appropriate size, slurrying the coal fines with agglomeration reagents and solvents, and then separating and pelletizing reacted coal fines, thereby removing reagent liquor from the fines.

Specifically, coal fines with particulate size less than two hundred (200) microns are selected for treatment. They are subjected to sufficient mixing and contact with the agglomeration reagents so as to cause the desired result. The reagent liquor is comprised of reagent and solvent fractions, such that there is a 1:1 ratio generally of liquor to coal fines (milliliters to grams). The slurry thus created is utilized as vehicle for handling and reacting with the coal fines, with a small portion of the reagent being incorporated into the agglomerated coal product.

The resulting mixture of reacted coal fines and reagent liquor is further processed to efficiently separate the coal fines from the liquid fractions. The fines at this point are physically compatible with agglomeration and are susceptible to such processes under surprisingly moderate conditions. Generally, temperature is not a concern in the agglomeration process of the present invention, but, as will be discussed further, it may have significant peripheral advantages in the recycling of reagent and the preparation of a final agglomerated product.

The agglomerated coal fines of the present invention have controllable hardness qualities. Compression of the treated fines results in pellets or briquettes of various sizes, although the five-eighths (1) inch by one (1) inch diameter pellet has significant commercial appeal. The treated and compressed product is surprisingly resistant to water absorption and is stable over a wide temperature range.

The advantages of the present invention result from the ability to produce the desired product under conditions utilizing low energy and high reagent recovery. Typical reagent recovery is as high as ninety-nine percent (99%) and actual reagent concentration may be adjusted to affect the final product hardness. These advantages and other distinguishments of the present invention will become more apparent as the preferred embodiment is discussed below.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a flow chart diagram of the process of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

A process for the agglomeration of coal fines and a product deriving therefrom, according to the present invention, is described herein. The coal fines from whatever source are made susceptible to compressive treatment, such that the resulting pellets or briquettes can be utilized via standard commercial applications.

Turning now to the drawing, FIG. 1 shows the steps of the process via a flow chart diagram. Generally the steps of the process of the present invention are as shown, although it is recognized that some minor variations may exist. For example, additional chemical treatment such as a washing step may be employed, as will be discussed further, and this is not represented within the steps outlined in FIG. 1.

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Other variations from the process thus outlined may be made without departing from the practice of the present invention. One skilled in the art may appreciate the possibilities of combining or adding steps to the process to effectuate a particular result. The objective of the present invention is the facilitation of developing or enhancing the agglomeration capabilities in untreated coal fines.

The coal fines utilized in the present invention may be derived from any of the three major groups of coal products or ranks. These are the bituminous, sub-bituminous and the lignite types, all of which are usually geographically segregated. The process of the present invention is applicable to all three types, although as will be discussed, the sub-bituminous coals may require additional treatments in order to achieve commercially acceptable grades of pellets or briquettes.

The source or origin of the coals notwithstanding, the generation of coal fines through many of the standard coal applications or in the handling or transport of coal will usually result in quantities of a powder looking material with poor prospects for immediate reuse. The fines are many times relegated to settling ponds where the accumulations are kept from becoming ecological disasters by virtue of submersion under water. Periodic excavation of such ponds produces large volumes of fines that for the most part, are handled as if they were hazardous waste materials. Utilizing coal fines from such sources even as this does not present a problem for the present invention.

The criterion for the coal fines to be employed in the preferred embodiment relate largely to maximum particle size and moisture content. The particle size is important since it defines the surface area being contacted by reagent, and as between the coal particles themselves. The moisture content is a factor in determining how long the process will take to complete, the occurrence of water being an inhibiting factor in the agglomeration process.

Moisture content, as indicated above, has an inhibiting effect on the agglomeration process, and coal fines with moisture content greater than twenty-two percent (22%) have significantly reduced efficiency. Since the moisture content does not impart a favorable effect, coal fines with overall moisture content substantially less than twenty-two percent (22%) would be compatible with the process of the preferred embodiment.

Moisture content in the coal fines retards the process of the present invention. This does not represent a problem normally in that insofar as the applicant has been able to determine most of the coal fines generated have less than the preferred level of twenty-two percent (22%) moisture. Tests have been run on coal fines containing as much as thirty-two to thirty-four percent (32-34%) moisture content with satisfactory, albeit delayed results.

The particle size of the coal fines is at least initially an important consideration. The process of the present invention preferentially operates with coal fines less than two hundred (200) microns in size. The distribution of particle size within any sample of coal fines will vary over a range. This variance may reflect the difference in the degree of handling or the origin of the coal fines. The fines need only be classified as to maximum size for the purposes of the present invention through means that are well known in the art and do not represent a part of the present invention. The smaller sized coal fine particles do not detract from the process; in

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fact it appears that the objective of sizing the coal fines relates to a requisite amount of surface area in order to initiate the reactions of the process. Particle sizes smaller than this requisite amount, may have enhanced efficiencies in terms of speed of reaction, but such advantages do not appear to be commercially distinguishable.

Coal fines have been tested specifically as low as six (6) micron particle size range. It is known in the industry particle sizes as small as six-hundredths (0.06) microns are found, although these have not specifically been tested. It is the belief of the applicant that all practical sizes of coal fines such as those being actually generated in related industries, will be susceptible to the process of the present invention at least to the extent that the particles are sized below the two hundred (200) micron level.

During the next phase of the process, the fines are mixed with the reagent chemicals. The reagent chemistry developed for this process favors a relationship whereby the reagent is a proton donor to the reactant coal fines. Various compounds have been tested in this regard, and a number of classes appear to be compatible with the process.

The class of aromatic tertiary amines appears to be the most effective of the compounds used as reagents in the process. Various members of the aromatic tertiary amines have been tested in the process of the present invention, including quinoxaline, cinnoline, quinazoline, acridine, phenazine, phenanthroline, phenanthridine, quinoline and isoquinoline. Of these, the preferred reagent is quinoline, although, as will be explained, isoquinoline is actually more effective.

Other organic groups have been tested for effectiveness in the process with the result that cyclic nonaromatic amines have been found to function in the process as well. Specifically morpholine is quite effective in achieving the desired reactions of the process. In addition, tests have been conducted on various primary amines which have similarly been effective in achieving the same results.

Tests conducted using morpholine, piperazine, piperidine, pyrrolidine, and pyrrole have shown these cyclic nonaromatic amines to induce the agglomeration characteristics of the present invention. Tests conducted on various primary amines such as dipropylamine and triethylamine have also proved to be effective in the process.

The preferred compound, quinoline, is typically diluted with a selected solvent. The preferred concentration range is equivalent to two (2) mls of quinoline dissolved in eight (8) mls of solvent per ten (10) grams of coal fines. Thus the overall ratio of reagent and solvent to coal fines is 1:1 volume to weight. In terms of the handling of the coal fine and reagent slurry, this ratio seems to have some advantages. It can be seen from the nature of the process that more or less solvent may be added without impairing the basic reactions, although it may mechanically impair the completeness of the process. The ratio of reagent and solvent to coal fines may be as high as 2:1 and still be commercially attractive. Ratios higher than this would still be effective in the process but corresponding increases in equipment handling problems and wastage render these less than optimal.

Amounts less than the two (2) mls of quinoline per ten (10) grams of coal fine sample may be utilized, but the results again will impact completeness of the reaction

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process. It appears from analysis of the recovered products and reactants that approximately one to two percent (1-2%) of the quinoline reactant is actually consumed or lost. The lowest concentration for reacting the quinoline of the present invention with coal fines would be two-hundredths (0.02) mls per a ten (10) gram sample of coal product. Commercial feasibility at this level is unattractive since the reaction kinetics would inhibit satisfactory yields over extended periods of time. Additions greater than the two (2) mls of quinoline per ten (10) grams of coal fines would be effective but redundant in terms of maximizing the benefits of process. Since many of the aromatic and nonaromatic amines feasible for this process are quite viscous, the effects of raising concentrations much above the two (2) mls per ten (10) gram level would result in difficulty in slurring the coal fines and reagents. As a practical limit, the usage of more than three (3) mls of quinoline would be excessive in the practice of the present invention. Adjustments in the concentration greater than 3 mls may be made if hardness of the compressed coal product is to be correspondingly increased. Further discussion of this aspect occurs within the specification. One skilled in the art would certainly appreciate the consequences of such additions and would modulate conditions to achieve the best effect possible.

The usage of isoquinoline in the present invention is more effective than the preferred quinoline. Tests have indicated that isoquinoline is four to ten percent (4-10%) more effective than quinoline. From a commercial standpoint it is difficult to acquire isoquinoline in amounts sufficient for large scale operation of the present invention. Thus, the readily available quinoline chemistry is preferred in order to achieve the stated objectives of economy.

The addition of solvent to the quinoline reagent not only has the benefit of enhancing the handling characteristics of the reagent mixture, but is believed to assist in dispersion and mixing. Additions of various solvents have observably improved the completeness of reaction between the quinoline of the preferred embodiment and the coal fines. Whether this is a function of the increased penetrability with solvent type materials or whether it relates to mechanical factors in mixing and handling, the effect is still the same in the sense that the reagents more completely interact with the reacting coal fines.

The preferred solvent is dimethylacetamide. Other solvents that have been tested and found to be effective include toluene, chloroform and carbon disulfide. The addition of solvent has the benefit of reducing the unpleasant odors associated with organic amines. In the case of the preferred reagent, quinoline, the aromatic amine odor is quite pungent and is typical of the members of its chemical family. The solvent additions for reasons not fully understood, appear to mask the amount of odor being generated by the reactant under process conditions.

The reagent chemicals of the process share many common attributes as would be expected. They are distillable and possess similar water solubility characteristics. As will be seen, these traits are useful and can be exploited in the process of the present invention to achieve recoveries and efficiencies that have prevented useful processing of coal fines in the past.

One curious aspect of the process of the preferred embodiment is that it has been found the reaction between the aromatic tertiary amines and the coal fines proceeds more efficiently in the dark. Specifically, the

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exclusion of visible light results in better reaction efficiencies and the recovery of viable reactants. For the purposes of the present invention, the process may be enclosed within reaction vessels, thus eliminating the exposure to visible light; or in the alternative, it may be conducted within facilities that can be darkened for the same purpose. To date, tests conducted have indicated that nominal intrusions for inspection of process wherein small amounts of visible light or select light, such as red filtered light, do not poison or spoil the process and the benefits normally achieved. The light sensitivity is related to the quinoline and isoquinoline products, since tests performed on other reactants have not indicated this same sensitivity.

The actual agglomeration process may be regulated by the usage of low weight alcohols. In particular, ethanol has been used successfully to regulate the speed of the agglomerating coal fines whether they are being vacuum dried or pelletized. The spray washing of coal fines with ethanol slows down the agglomeration process, thus allowing the development of a compact and cosmetically acceptable coal product. The actual adjustment required may depend in part on the origin of the coal fines, the particular reagent and solvent combination, and the conditions of the drying process. Given the volatile nature of the ethanol, it is not found in the resulting coal product in any significant quantity. The purging or washing of coal fines with alcohol is merely a control feature for improving the cosmetics and quality of the coal pellet, and as such does not represent a critical factor in the practice of the process.

Turning now to the post-reaction aspects of the process, the coal fines reacted with the appropriate organic amine are removed from the reaction slurry. The coal fines may be allowed to settle in a sedimentation vessel and then are drawn off for subsequent drying and compressing. The aspects of sedimentation are well known in the art and are a matter of engineering selection as to the deployment of size and type of vessels, withdrawal apparatus, and other functional attributes.

The settled coal fines, once collected, can be dried successfully by at least two processes. The first is vacuum filtration wherein the collected coal fines are presented to vacuum drying apparatus such as rotating vacuum filters. The reaction liquors are extracted from the collected coal fines and are returnable to the process.

The collected coal fines may also be dried by means of pelletizing. It has been found that by pelletizing the product of the present process under conditions of moderate temperatures, that flash volatilization of the reagent liquor takes place, leaving a pressed, dry coal fine product. The vaporized reagent liquor may be collected and returned back to the process.

Neither method of post-reaction processing should be viewed as a limitation on the process itself. The mechanical treatments involved can be scaled to compatibly receive the output of the process so as to provide a virtually continuous treatment system.

EXAMPLE I

A one hundred (100) gram of coal fines is sieved for particle size under two hundred (200) microns. The sieved fines are then added to a reagent comprising twenty (20) mls of commercial grade quinoline dissolved in eight (80) mls of dimethylacetamide. The slurry is mixed for three (3) minutes and is vacuum filtered to remove any liquid portions as filtrate. The

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filter cake is allowed to air dry and results in a compact coal agglomerate product.

EXAMPLE II

A one hundred (100) gram sample of coal is treated as above, except the slurry mixture is added directly to a pelletizing device. While maintaining the temperature of a pelletizer at one hundred degrees Centigrade (100° C.), the slurry is compressed forming a pellet with an apparent density between 1.0 grams per cubic centimeter (cm³) and 1.5 grams per cm³. The resulting pellet has the appearance of a solid coal product and resists crumbling and dusting.

EXAMPLE III

Coal fines were sieved for particle sizes below one hundred fifty (150) microns. The fines thus collected were added to a reagent comprising ninety-eight percent (98%) m-xylene fused with two percent (2%) pyridine. The slurry is then agitated for one-half (1/2) minute, and then a subsequent addition of two percent (2%) by volume of toluene is added. Upon further agitation for approximately two (2) minutes, the solution is then vacuumed filtered and the filter cake is allowed to air dry. The cake produces a satisfactory agglomerate giving the appearance of a coal solid.

As can be seen from the foregoing, various methods for practicing the present invention are possible. The desired end product of the process, however, is a compressed coal product giving the appearance of a coal solid, with high integrity that is resistant to crumbling or dusting. In addition, beneficial characteristics such as low moisture content and resistance to moisture pick-up are results of the process of the present invention.

Specific testing of the pellets produced from the present invention have shown that the stability of the pellets is very high, exceeding industry expectations in most cases. Testing under extreme conditions has shown that the integrity of the pellet is maintained during exposures between minus five degrees centigrade (-5° C.) and up to seventy degree centigrade (70° C.) for days at a time. In addition the pellet integrity was maintained under the same conditions when the pellet was totally immersed in water. Testing of the immersed pellets range from one (1) hour of immersion to three (3) days or more with no loss of pellet integrity.

The hardness of the compressed product from the process of the present invention can be measured via the Hardgrove Grindability Index. The Hardgrove Index of the vacuumed filtered product ranged from 77.0 for pellets formed under twenty-three (23) inches Hg vacuum to 83.0 on the Hardgrove scale under conditions of twenty-seven (27) inches Hg vacuum. Surprisingly, the hardness of the final coal product can be adjusted by modifying the reaction conditions. Increasing the ratio of the preferred reagent quinoline to solvent will result in increasing the hardness of the pellets formed by the present process.

Agglomerated coal fines were tested for hardness under varying concentrations of reagents. At a concentration of approximately sixty percent (60%) quinoline, or six (6) mls per ten (10) grams of coal fines, a maximum hardness of product was achieved which is substantially greater than virgin coal. While this concentration of the preferred reagent is greater than the range discussed before, it is a reflection of the range of characteristics that can be developed by the process. The consequences of agglomerated coal fine pellets with

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hardnesses greater than coal itself mainly impacts in transport and handling.

The characteristic of water resistance of the pellets produced from this process may come about as a result of the nature of the reaction between the chemistry in the coal fines. It is believed that the final agglomerated product is a more saturated organic product than the starting material and the result of this hydrogen loading is to resist infiltration of the coal product by water. The hydrophobic characteristics of the finished product have significant commercial interest since transport of moisture laden coals adds to the cost of transport and results in difficulties especially in cold weather. The tendency for coal products to freeze together can deter the usage of coal in northern climates where the demand for cheap energy resources is most acute. In addition, the infiltration of water into coal products lowers the net BTU (British Thermal Unit) value of combustion. Eliminating or reducing the infiltration of water is a feature of the present invention that directly affects the economics and feasibility of utilizing agglomerated coal fines.

The usage of the present process on sub-bituminous coal, or "western coal", is possible by slight modification. It has been found that the iron concentration, in the form of hematite, plays at least a modest role in the agglomeration process. While hematite is naturally occurring in coals from other sources, the western coal contains little and needs to have adjustments in the hematite concentration in order to achieve maximum results under the process of the present invention.

In order to optimize the conditions for pelletizing, it has been found that additions of one percent (1%) hematite by weight results in pellets of high quality. Additions greater than this amount will still result in good quality pellets, however, the additional increase in ash content is considered undesirable. Correspondingly, less than one percent (1%) hematite additions to western coal fines reduces the pellet quality proportional. One skilled in the art could modulate additions above and below the optimal one percent (1%) range to achieve an engineered result. From a general standpoint, it would be undesirable in any event to increase the hematite concentration above five percent (5%) since the utility of the resulting pellet would be reduced to the point of making it impractical for most routes of consumption.

The inclusion of hematite in the western coal fines has been tested for any potential effects on Hardgrove Index. Testing has indicated that additions do not contribute in any significant way to increases in the Hardgrove Index, the hematite concentration apparently assisting in the agglomeration process itself by adjusting acid/base ratios.

The usage of a pelletizer in the present process is an advantage over the vacuum or air drying of agglomerated coal fines. The pelletizing apparatus is typically constructed to operate at a temperature of approximately one hundred degrees Centigrade (100° C.) and under thirty (30) inches Hg pressure. The heat in the pelletizer head, along with the action of the pelletizing device itself, is sufficient to drive the reagent and solvent portion from the pelletizing apparatus. The volatilization of the preferred quinoline and dimethylacetamide can be controllably recovered by condensation techniques. Thus, the loss of valuable chemistry is reduced while providing a means for expeditious drying of the coal fine product.

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The recovery of reagent and solvent from the pelletizer has been demonstrated to be as high as ninety-nine percent (99%). It appears that from the work done so far that the pelletizer recoveries are expected to be higher than that which may be achieved by a vacuum filtration. Since the capacity of the pelletizing operation can be adjusted to handle the volume of a continuous system, it represents the most efficient means of practicing the art of the present invention.

The quality of the pellet produced as a result of the present process can be affected by the exposure to visible light, by the water content, and by the hardness engineered for the pellet. Commercial acceptance of pelletized coal fines is primarily founded on the usage of these as a combustible material. Feedstocks for boilers and furnaces would find the pellet form most attractive, easily handled and transportable. With these factors in mind, it can be seen that the pellets of the present invention can be developed specifically for the application to achieve the desired qualities for usage in the particular application.

It can be appreciated by one skilled in the art that various and modifications on the preferred embodiment of the present invention can be practiced without straying from the spirit and scope of the present invention. The examples and preferences expressed are meant to be illustrative of the practice of the process and are not expressed as limitations thereof.

I claim:

1. A process for the agglomeration of coal fines comprising the steps of:

slurrying the coal fines with an effective amount of an agglomerating liquid comprising a reagent chemical and a solvent in which the reagent chemical is soluble, creating a slurry solution, the reagent chemical comprising one or a combination of members selected from the group consisting of aromatic tertiary amines, cyclic nonaromatic amines, and primary organic amines;

mixing and reacting the coal fines with the reagent chemical and solvent, such that the coal fines are affected by the reagent chemical and thereafter made amenable to compressible agglomeration;

removing the coal fines from the slurry solution; drying the coal fines by removing the reagent chemical and solvent from the coal fines;

recovering and retaining the reagent chemical and solvent for reuse in the process; and

compressibly agglomerating the coal fines under sufficient pressure to produce agglomeration.

2. A process for the agglomeration of coal fines as in claim 1, wherein the solvent comprises one or a combination of members selected from the group consisting of toluene, chloroform, carbon disulfide and dimethylacetamide.

3. A process for the agglomeration of coal fines as in claim 1, including the step of compressing the dried coal fines into pellet form.

4. A process for the agglomeration of coal fines as in claim 1, wherein the coal fines are dried in a pelletizer operable at conditions of sufficient temperature and pressure to evaporate the reagent chemical and solvent.

5. A process according to claim 4, wherein the pelletizer compresses the coal fines at a pressure of no more than about thirty (30) inches Hg at a temperature sufficient to remove unused reagent and solvent by evaporation.

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6. A process for the agglomeration of coal fines as in claim 1, wherein the reagent comprises quinoline or isoquinoline or a combination thereof.

7. A process for the agglomeration of coal fines as in claim 6, including the step of restricting visible light from the slurry solution.

8. A process for the agglomeration of coal fines as in claim 1, wherein the agglomerating liquid is admixed in a ratio of agglomerating liquid (milliliters) to coal fines (grams) from about 1:1 to about 2:1.

9. A process for the agglomeration of coal fines as in claim 1, wherein said coal fines are derived from sub-bituminous coals and the process includes the step of adding hematite to the coal fines in the amount of approximately one percent (1%) to approximately five percent (5%) by weight of the coal fines.

10. A process for the agglomeration of coal fines as in claim 1, including the step of washing the coal fines with ethanol prior to drying.

11. A process according to claim 1, wherein the reagent chemical comprises one or a combination of aromatic tertiary amines selected from the group of consisting of quinoline, isoquinoline, quinoxaline, cinnoline, quinazoline, acridine, phenazine, phenanthroline, and phenanthridine.

12. A process according to claim 1, wherein the reagent chemical comprises one or a combination of cyclic nonaromatic amines selected from the group consisting of morpholine, piperazine, piperidine, pyrrolidine, and pyrrole.

13. A process according to claim 1, wherein the reagent chemical comprises one or a combination of primary amines consisting of dipropylamine and triethylamine.

14. A process according to claim 1, wherein the reagent chemical comprises quinoline or isoquinoline or a combination thereof and the solvent comprises dimethylacetamide.

15. A process according claim 1, wherein the reagent chemical and solvent are mixed in the ratio of two (2) parts reagent chemical to about eight (8) parts solvent by volume and the agglomeration liquid is admixed with the coal fines in the ratio of about 1:1 (mls liquid to grams of coal fines).

16. A process according to claim 14, wherein the reagent chemical is admixed with coal fines in the ratio of about two-hundredths (0.02) mls to at least two (2) mls reagent chemical to about ten (10) grams of coal fines.

17. A process for the agglomeration of coal fines comprising the steps of:

slurrying the coal fines with an effective amount of a reagent chemical and solvent for the reagent chemical, where the reagent chemical is comprised of quinoline or isoquinoline or a combination thereof, and where visible light is substantially eliminated as a condition of the process;

mixing and reacting the coal fines with the reagent chemical and solvent under conditions such that the coal fines are affected by the reagent chemical and thereafter made amenable to compressible agglomeration;

removing the coal fines from the slurry solution by settling the coal fines in a sedimentation vessel; removing the coal fines from the sedimentation vessel;

drying the coal fines by evaporating the reagent chemical and solvent from the coal fines;

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recovering and retaining the reagent chemical and solvent from the sedimentation vessel for reuse in the process; and

compressibly agglomerating the coal fines under sufficient pressure to produce agglomeration.

18. A process for the agglomeration of coal fines as in claim 17, including the step of recovering and retaining the reagent chemical and solvent evaporated from the coal fines.

19. A process for the agglomeration of coal fines comprising the steps of:

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slurrying the coal fines with an effective amount of an agglomerating liquid comprising n-xylene and pyridine, creating a slurry solution;

mixing and reacting the coal fines with the agglomerating liquid in the presence of an effective amount of the solvent toluene, such that the coal fines are affected by the agglomerating liquid and thereafter made amenable to compressible agglomeration;

removing the coal fines from the slurry solution; drying the coal fines by removing the agglomerating liquid and solvent from the coal fines;

recovering and retaining the agglomerating liquid and solvent for reuse in the process; and compressibly agglomerating the coal fines under sufficient pressure to produce agglomeration.

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BY-LAWS

OF

ADTECH INC. OF ILLINOIS

ARTICLE I

OFFICES

The corporation shall continuously maintain in the State of Illinois a registered office and a registered agent whose business office is identical with such registered office, and may have other offices within or without the state.

ARTICLE II

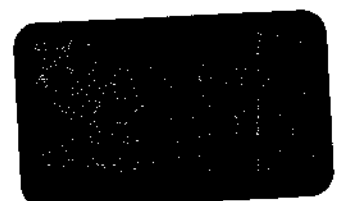
SHAREHOLDERS

SECTION 1. ANNUAL MEETING. An annual meeting of the shareholders shall be held on the _____ in of each year or at such time as the board of directors may designate for the purpose of electing directors and for the transaction of such other business as may come before the meeting. If the day fixed for the annual meeting shall be a legal holiday, such meeting shall be held on the next succeeding business day.

SECTION 2. SPECIAL MEETINGS. Special meetings of the shareholders may be called either by the president, by the board of directors or by the holders of not less than one-fifth of all the outstanding shares of the corporation entitled to vote, for the purpose or purposes stated in the call of the meeting.

SECTION 3. PLACE OF MEETING. The board of directors may designate any place, as the place of meeting for any annual meeting or for any special meeting called by the board of directors. If no designation is made, or if a special meeting be otherwise called, the place of meeting shall be at _____

SECTION 4. NOTICE OF MEETINGS. Written notice stating the place, date, and hour of the meeting and, in the case of a special meeting, the purpose or purposes for which the meeting is called, shall be delivered not less than 10 nor more than 60 days before the date of the meeting, or in the case of a merger,



consolidation, share exchange, dissolution or sale, lease or exchange of assets not less than 20 nor more than 60 days before the date of the meeting, either personally or by mail, by or at the direction of the president, or the secretary, or the officer or persons calling the meeting, to each shareholder of record entitled to vote at such meeting. If mailed, such notice shall be deemed to be delivered when deposited in the United States mail addressed to the shareholder at his or her address as it appears on the records of the corporation, with postage thereon prepaid. When a meeting is adjourned to another time or place, notice need not be given of the adjourned meeting if the time and place thereof are announced at the meeting at which the adjournment is taken.

SECTION 5. FIXING OF RECORD DATE. For the purpose of determining the shareholders entitled to notice of or to vote at any meeting of shareholders, or shareholders entitled to receive payment of any dividend, or in order to make a determination of shareholders for any other proper purpose, the board of directors of the corporation may fix in advance a date as the record date for any such determination of shareholders, such date in any case to be not more than 60 days and for a meeting of shareholders, not less than 10 days, or in the case of a merger, consolidation, share exchange, dissolution or sale, lease or exchange of assets, not less than 20 days before the date of such meeting. If no record date is fixed for the determination of shareholders entitled to notice of or to vote at a meeting of shareholders, or shareholders entitled to receive payment of a dividend, the date on which notice of the meeting is mailed or the date on which the resolution of the board of directors declaring such dividend is adopted, as the case may be, shall be the record date for such determination of shareholders. A determination of shareholders shall apply to any adjournment of the meeting.

SECTION 6. VOTING LISTS. The officer or agent having charge of the transfer book for shares of the corporation shall make, within 20 days after the record date for a meeting of shareholders or 10 days before such meeting, whichever is earlier, a complete list of the shareholders entitled to vote at such meeting, arranged in alphabetical order, with the address of and the number of shares held by each, which list, for a period of 10 days prior to such meeting, shall be kept on file at the registered office of the corporation and shall be subject to inspection by any shareholder, and to copying at the shareholder's expense, at any time during usual business hours. Such list shall also be produced and kept open at the time and place of the meeting and shall be subject to the inspection of any shareholder during the whole time of the meeting. The original share ledger or transfer book, or a duplicate thereof kept in this State, shall be prima facie evidence as to who are the shareholders entitled to examine such list or share ledger or transfer book or to vote at any meeting of shareholders.

SECTION 7. QUORUM. The holders of a majority of the outstanding shares of the corporation entitled to vote on a matter, represented in person or by proxy, shall constitute a quorum for consideration of such matter at any meeting of shareholders, but in no event shall a quorum consist of less than one-third of the outstanding shares entitled so to vote; provided that if less than a majority of the outstanding shares are represented at said meeting, a majority of the shares so represented may adjourn the meeting at any time without further notice. If a quorum is present, the affirmative vote of the majority of the shares represented at the meeting shall be the act of the shareholders, unless the vote of a greater number or voting by classes is required by the Business Corporation Act, the articles of incorporation or these by-laws. At any adjourned meeting at which a quorum shall be present, any business may be transacted which might have been transacted at the original meeting. Withdrawal of shareholders from any meeting shall not cause failure of a duly constituted quorum at that meeting.

SECTION 8. PROXIES. Each shareholder may appoint a proxy to vote or otherwise act for him or her by signing an appointment form and delivering it to the person so appointed, but no such proxy shall be valid after 11 months from the date of its execution, unless otherwise provided in the proxy.

SECTION 9. VOTING OF SHARES. Each outstanding share, regardless of class, shall be entitled to one vote in each matter submitted to vote at a meeting of shareholders, and in all elections for directors, every shareholder shall have the right to vote the number of shares owned by such shareholder for as many persons as there are directors multiplied by the number of such shares or to distribute such cumulative votes in any proportion among any number of candidates. Each shareholder may vote either in person or by proxy as provided in SECTION 8 hereof.

SECTION 10. VOTING OF SHARES BY CERTAIN HOLDERS. Shares held by the corporation in a fiduciary capacity may be voted and shall be counted in determining the total number of outstanding shares entitled to vote at any given time.

Shares registered in the name of another corporation, domestic or foreign, may be voted by any officer, agent, proxy or other legal representative authorized to vote such shares under the law of incorporation of such corporation.

Shares registered in the name of a deceased person, a minor ward or a person under legal disability, may be voted by his or her administrator, executor or court appointed guardian, either in person or by proxy without a transfer of such shares into the name of such administrator, executor or court appointed guardian. Shares registered in the name of a trustee may be voted by him or her, either in person or by proxy.

Shares registered in the name of a receiver may be voted by such receiver, and shares held by or under the control of a receiver may be voted by such receiver without the transfer thereof into his or her name if authority to do so is contained in an appropriate order of the court by which such receiver was appointed.

A shareholder whose shares are pledged shall be entitled to vote such shares until the shares have been transferred into the name of the pledgee, and thereafter the pledgee shall be entitled to vote the shares so transferred.

Any number of shareholders may create a voting trust for the purpose of conferring upon a trustee or trustees the right to vote or otherwise represent their shares, for a period not to exceed 10 years, by entering into a written voting trust agreement specifying the terms and conditions of the voting trust, and by transferring their shares to such trustee or trustees for the purpose of the agreement. Any such trust agreement shall not become effective until a counterpart of the agreement is deposited with the corporation at its registered office. The counterpart of the voting trust agreement so deposited with the corporation shall be subject to the same right of examination by a shareholder of the corporation, in person or by agent or attorney, as are the books and records of the corporation, and shall be subject to examination by any holder of a beneficial interest in the voting trust, either in person or by agent or attorney, at any reasonable time for any proper purpose.

Shares of its own stock belonging to this corporation shall not be voted, directly or indirectly, at any meeting and shall not be counted in determining the total number of outstanding shares at any given time, but shares of its own stock held by it in a fiduciary capacity may be voted and shall be counted in determining the total number of outstanding shares at any given time.

SECTION 11. CUMULATIVE VOTING. In all elections for directors, every shareholder shall have the right to vote in person or by proxy, the number of shares owned by him/her, for as many persons as there are directors to be elected, or to cumulate such votes, and give one candidate as many votes as the number of directors multiplied by the number of his/her shares shall equal, or to distribute them on the same principle among as many candidates as he/she shall think fit.

The articles of incorporation may be amended to limit or eliminate cumulative voting rights in all or specified circumstances, or to limit or deny voting rights or to provide special voting rights as to any class or classes or series of shares of the corporation.

SECTION 12. INSPECTORS. At any meeting of shareholders, the presiding officer may, or upon the request of any shareholder, shall appoint one or more persons as inspectors for such meeting.

Such inspectors shall ascertain and report the number of shares represented at the meeting, based upon their determination of the validity and effect of proxies; count all votes and report the results; and do such other acts as are proper to conduct the election and voting with impartiality and fairness to all the shareholders.

Each report of an inspector shall be in writing and signed by him or her or by a majority of them if there be more than one inspector acting at such meeting. If there is more than one inspector, the report of a majority shall be the report of the inspectors. The report of the inspector or inspectors on the number of shares represented at the meeting and the results of the voting shall be prima facie evidence thereof.

SECTION 13. INFORMAL ACTION BY SHAREHOLDERS. Any action required to be taken at a meeting of the shareholders, or any other action which may be taken at a meeting of the shareholders, may be taken without a meeting and without a vote, if a consent in writing, setting forth the action so taken shall be signed (a) if 5 days prior notice of the proposed action is given in writing to all of the shareholders entitled to vote with respect to the subject matter hereof, by the holders of outstanding shares having not less than the minimum number of votes that would be necessary to authorize or take such action at a meeting at which all shares entitled to vote thereon were present and voting or (b) by all of the shareholders entitled to vote with respect to the subject matter thereof.

Prompt notice of the taking of the corporate action without a meeting by less than unanimous written consent shall be given in writing to those shareholders who have not consented in writing. In the event that the action which is consented to is such as would have required the filing of a certificate under any section of the Business Corporation Act if such action had been voted on by the shareholders at a meeting thereof, the certificate filed under such section shall state, in lieu of any statement required by such section concerning any vote of shareholders, that written consent has been given in accordance with the provisions of SECTION 7.10 of the Business Corporation Act and that written notice has been given as provided in such SECTION 7.10.

SECTION 14. VOTING BY BALLOT. Voting on any question or in any election may be by voice unless the presiding officer shall order or any shareholder shall demand that voting be by ballot.

Section 4. PREEMPTIVE RIGHTS. Each holder of Common Stock of this corporation shall have the first right (subject to pragmatic adjustments to avoid the issue of fractional shares) to purchase shares of Common Stock of this corporation that may hereafter from time to time be issued (whether or not presently authorized), including shares from the Treasury of the corporation, in the ratio that the number of shares of Common Stock he holds at the time of the issue bears to the total number of shares of Common Stock outstanding. This right shall be deemed waived by any holder of Common Stock who does not exercise it and pay for the stock preempted within thirty days of receipt of a notice in writing from the corporation inviting him to exercise the right. A holder of Common Stock shall not, solely because of his holdings of Common Stock, have a right to purchase shares of Preferred Stock that may hereafter be issued.

A holder of Preferred Stock shall not, solely because of his holdings of Preferred Stock, have a right to purchase shares of any class that may hereafter be issued by the corporation.

Section 5. RESTRICTION ON SHARE TRANSFER. No holder of shares of stock of the corporation shall sell, assign, transfer, pledge, hypothecate or in any other manner dispose of any of them, without first giving written notice to the corporation at its statutory office in the State of Illinois. In case the corporation--or in case of its failure or refusal, the remaining shareholders of the corporation--shall fail to pay the holder the book value of the shares desired to be disposed of within thirty (30) days from receipt of notice or in installment payments as provided by a Repurchase Agreement, then the holder may dispose of them as he shall see fit.

The book value of the shares shall be ascertained by application of the usual methods of accounting employed by the corporation, applied in a consistent manner, and shall be taken from a balance sheet reflecting the net worth of the corporation at the end of the fiscal quarter nearest to the date of the delivery of said notice.

In case of a dispute as to the book value of the shares, then the book value shall be ascertained by an independent certified public accountant selected by the corporation and computed in accordance with the provision contained in a Repurchase Agreement signed by the shareholders.

In case of the death of a shareholder, nothing contained herein shall prohibit a legatee of said shares, or a surviving joint tenant of said shares, from becoming the registered owner thereof on the books of the corporation, and the subsequent reissuance of said shares to the legatee or surviving joint tenant, nor shall this Bylaw prohibit any legatee of a deceased shareholder from disposing of shares so bequeathed, or so acquired as joint tenant, from transferring said shares to children of the deceased shareholder; but all restrictions hereby imposed upon disposition of shares of stock of the corporation shall otherwise apply to a legatee or surviving joint tenant of any deceased shareholder, from time to time.

Nothing contained herein prohibits a shareholder from transferring all or part of his stock without the consent of the corporation or other shareholders as a gift to or for the benefit of a spouse or other member of his direct family, who shall hold it subject to the terms of this restriction or share transfer provision.

ARTICLE III

DIRECTORS

SECTION 1. GENERAL POWERS. The business of the corporation shall be managed by or under the direction of its board of directors. A majority of the board of directors may establish reasonable compensation for their services and the services of other officers, irrespective of any personal interest.

SECTION 2. NUMBER, TENURE AND QUALIFICATIONS. The number of directors of the corporation shall be seven. Each director shall hold office until the next annual meeting of shareholders; or until his successor shall have been elected and qualified. Directors need not be residents of Illinois or shareholders of the corporation. The number of directors may be increased or decreased from time to time by the amendment of this section. No decrease shall have the effect of shortening the term of any incumbent director.

SECTION 3. REGULAR MEETINGS. A regular meeting of the board of directors shall be held without other notice than this by-law, immediately after the annual meeting of shareholders. The board of directors may provide, by resolution, the time and place for holding of additional regular meetings without other notice than such resolution.

SECTION 4. SPECIAL MEETINGS. Special meetings of the board of directors may be called by or at the request of the president or any two directors. The person or persons authorized to call special meetings of the board of directors may fix any place as the place for holding any special meeting of the board of directors called by them.

SECTION 5. NOTICE. Notice of any special meeting shall be given at least days previous thereto by written notice to each director at his business address. If mailed, such notice shall be deemed to be delivered when deposited in the United States mail so addressed, with postage thereon prepaid. If notice be given by telegram, such notice shall be deemed to be delivered when the telegram is delivered to the telegram company. The attendance of a director at any meeting shall constitute a waiver of notice of such meeting, except where a director attends a meeting for the express purpose of objecting to the transaction of any business because the meeting is not lawfully called or convened. Neither the business to be transacted at, nor the purpose of, any regular or special meeting of the board of directors need be specified in the notice or waiver of notice of such meeting.

SECTION 6. QUORUM. A majority of the number of directors fixed by these by-laws shall constitute a quorum for transaction of business at any meeting of the board of directors, provided

that if less than a majority of such number of directors are present at said meeting, a majority of the directors present may adjourn the meeting at any time without further notice.

SECTION 7. MANNER OF ACTING. The act of the majority of the directors present at a meeting at which a quorum is present shall be the act of the board of directors, unless the act of a greater number is required by statute, these by-laws, or the articles of incorporation.

SECTION 8. VACANCIES. Any vacancy on the board of directors may be filled by election at the next annual or special meeting of shareholders. A majority of the board of directors may fill any vacancy prior to such annual or special meeting of shareholders.

SECTION 9. RESIGNATION AND REMOVAL OF DIRECTORS. A director may resign at any time upon written notice to the board of directors. A director may be removed with or without cause, by a majority of shareholders if the notice of the meeting names the director or directors to be removed at said meeting.

SECTION 10. INFORMAL ACTION BY DIRECTORS. The authority of the board of directors may be exercised without a meeting if a consent in writing, setting forth the action taken, is signed by all of the directors entitled to vote.

SECTION 11. COMPENSATION. The board of directors, by the affirmative vote of a majority of directors then in office, and irrespective of any personal interest of any of its members, shall have authority to establish reasonable compensation of all directors for services to the corporation as directors, officers or otherwise notwithstanding any director conflict of interest. By resolution of the board of directors, the directors may be paid their expenses, if any, of attendance at each meeting of the board. No such payment previously mentioned in this section shall preclude any director from serving the corporation in any other capacity and receiving compensation therefor.

SECTION 12. PRESUMPTION OF ASSENT. A director of the corporation who is present at a meeting of the board of directors at which action on any corporate matter is taken shall be conclusively presumed to have assented to the action taken unless his or her dissent shall be entered in the minutes of the meeting or unless he or she shall file his or her written dissent to such action with the person acting as the secretary of the meeting before the adjournment thereof or shall forward such dissent by registered or certified mail to the secretary of the corporation immediately after the adjournment of the meeting. Such right to dissent shall not apply to a director who voted in favor of such action.

SECTION 13. COMMITTEES. A majority of the board of directors may create one or more committees of two or more members to exercise appropriate authority of the board of directors. A majority of such committee shall constitute a quorum for transaction of business. A committee may transact business without a meeting by unanimous written consent.

ARTICLE IV

OFFICERS

SECTION 1. NUMBER. The officers of the corporation shall be a president, one or more vice-presidents, a treasurer, a secretary, and such other officers as many be elected or appointed by the board of directors. Any two or more offices may be held by the same person.

SECTION 2. ELECTION AND TERM OF OFFICE. The officers of the corporation shall be elected annually by the board of directors at the first meeting of the board of directors held after each annual meeting of shareholders. If the election of officers shall not be held at such meeting, such election shall be held as soon thereafter as conveniently may be. Vacancies may be filled or new offices created and filled at any meeting of the board of directors. Each officer shall hold office until his successor shall have been duly elected and shall have qualified or until his death or until he shall resign or shall have been removed in the manner hereinafter provided. Election of an officer shall not of itself create contract rights.

SECTION 3. REMOVAL. Any officer elected or appointed by the board of directors may be removed by the board of directors whenever in its judgment the best interest of the corporation would be served thereby, but such removal shall be without prejudice to the contract rights, if any, of the person so removed.

SECTION 4. PRESIDENT. The president shall be the principal executive officer of the corporation. Subject to the direction and control of the board of directors, he/she shall be in charge of the business of the corporation; he shall see that the resolutions and directions of the board of directors are carried into effect except in those instances in which that responsibility is specifically assigned to some other person by the board of directors; and, in general, he/she shall discharge

all duties incident to the office of president and such other duties as may be prescribed by the board of directors from time to time. He shall preside at all meetings of the shareholders and of the board of directors. Except in those instances in which the authority to execute is expressly delegated to another officer or agent of the corporation or a different mode of execution is expressly prescribed by the board of directors or these by-laws, he may execute for the corporation certificates for its shares, and any contracts, deeds, mortgages, bonds or other instruments which the board of directors has authorized to be executed, and he may accomplish such execution either under or without the seal of the corporation and either individually or with the secretary, any assistant secretary, or any other officer thereunto authorized by the board of directors, according to the requirements of the form of the instrument. He may vote all securities which the corporation is entitled to vote except as and to the extent such authority shall be vested in a different officer or agent of the corporation by the board of directors.

SECTION 5. THE VICE-PRESIDENTS. The vice-president (or in the event there be more than one vice-president, each of the vice-presidents) shall assist the president in the discharge of his/her duties as the president may direct and shall perform such other duties as from time to time may be assigned to him/her by the president or by the board of directors. In the absence of the president or in the event of his/her inability or refusal to act, the vice-president (or in the event there be more than one vice-president, the vice-presidents in the order designated by the board of directors, or by the president if the board of directors has not made such a designation, or in the absence of any designation, then in the order of seniority of tenure as vice president) shall perform the duties of the president, and when so acting, shall have the powers of and be subject to all the restrictions upon the president. Except in those instances in which the authority to execute is expressly delegated to another officer or agent of the corporation or a different mode of execution is expressly prescribed by the board of directors or these by-laws, the vice president (or each of them if there are more than one) may execute for the corporation certificates for its shares and any contracts, deeds, mortgages, bonds or other instruments which the board of directors has authorized to be executed, and he/she may accomplish such execution either under or without the seal of the corporation and either individually or with the secretary, any assistant secretary, or any other officer thereunto authorized by the board of directors, according to the requirements of the form of the instrument.

SECTION 6. THE TREASURER. The treasurer shall be the principal accounting and financial officer of the corporation. He shall: (a) have charge of and be responsible for the maintenance of adequate books of account for the corporation; (b) have charge

and custody of all funds and securities of the corporation, and be responsible therefor and for the receipt and disbursement thereof; and (c) perform all the duties incident to the office of treasurer and such other duties as from time to time may be assigned to him by the president or by the board of directors. If required by the board of directors, the treasurer shall give a bond for the faithful discharge of his duties in such sum and with such surety or sureties as the board of directors may determine.

SECTION 7. THE SECRETARY. The secretary shall: (a) record the minutes of the shareholders' and of the board of directors' meetings in one or more books provided for that purpose; (b) see that all notices are duly given in accordance with the provisions of these by-laws or as required by law; (c) be custodian of the corporate records and of the seal of the corporation; (d) keep a register of the post-office address of each shareholder which shall be furnished to the secretary by such shareholder; (e) sign with the president, or a vice-president, or any other officer thereunto authorized by the board of directors, certificates for shares of the corporation, the issue of which shall have been authorized by the board of directors, and any contracts, deeds, mortgages, bonds, or other instruments which the board of directors has authorized to be executed, according to the requirements of the form of the instrument, except when a different mode of execution is expressly prescribed by the board of directors or these by laws; (f) have general charge of the stock transfer books of the corporation; (g) have authority to certify the by-laws, resolutions of the shareholders and board of directors and committees thereof, and other documents of the corporation as true and correct copies thereof, and (h) perform all duties incident to the office of secretary and such other duties as from time to time may be assigned to him/her by the president or by the board of directors.

SECTION 8. ASSISTANT TREASURERS AND ASSISTANT SECRETARIES. The assistant treasurers and assistant secretaries shall perform such duties as shall be assigned to them by the treasurer or the secretary, respectively, or by the president or the board of directors. The assistant secretaries may sign with the president, or a vice-president, or any other officer thereunto authorized by the board of directors, certificates for shares of the corporation, the issue of which shall have been authorized by the board of directors, and any contracts, deeds, mortgages, bonds, or other instruments which the board of directors has authorized to be executed, according to the requirements of the form of the instrument, except when a different mode of execution is expressly prescribed by the board of directors or these by-laws. The assistant treasurers shall respectively, if required by the board of directors, give bonds for the faithful discharge of their duties in such sums and with such sureties as the board of directors shall determine.

SECTION 9. SALARIES. The salaries of the officers shall be fixed from time to time by the board of directors and no officer shall be prevented from receiving such salary by reason of

the fact that he is also a director of the corporation.

ARTICLE V

CONTRACTS, LOANS, CHECKS AND DEPOSITS

SECTION 1. CONTRACTS. The board of directors may authorize any officer or officers, agent or agents, to enter into any contract or execute and deliver any instrument in the name of and on behalf of the corporation, and such authority may be general or confined to specific instances.

SECTION 2. LOANS. No loans shall be contracted on behalf of the corporation and no evidences of indebtedness shall be issued in its name unless authorized by a resolution of the board of directors.

SECTION 3. CHECKS, DRAFTS, ETC. All checks, drafts or other orders for the payment of money, notes or other evidences of indebtedness if issued in the name of the corporation, shall be signed by such officer or officers, agent or agents of the corporation and in such manner as shall from time to time be determined by resolution of the board of directors.

SECTION 4. DEPOSITS. All funds of the corporation not otherwise employed shall be deposited from time to time to the credit of the corporation in such banks, trust companies or other depositaries as the board of directors may select.

ARTICLE VI

SHARES AND THEIR TRANSFER

SECTION 1. SHARES REPRESENTED BY CERTIFICATES AND UNCERTIFICATED SHARES. Shares either shall be represented by certificates or shall be uncertificated shares.

Certificates representing shares of the corporation shall be signed by the appropriate officers and may be sealed with the seal or a facsimile of the seal of the corporation. If a certificate is countersigned by a transfer agent or registrar, other than the corporation or its employee, any other signatures may be facsimile. Each certificate representing shares shall be consecutively numbered or otherwise identified, and shall also state the name of the person to whom issued, the number and class of shares (with designation of series, if any), the date of issue, and that the corporation is organized under Illinois law. If the corporation is authorized to issue shares of more than one class or of series within a class, the certificate shall also contain such information or statement as may be required by law.

Unless prohibited by the articles of incorporation, the board of directors may provide by resolution that some or all of

any class or series of shares shall be uncertificated shares. Any such resolution shall not apply to shares represented by a certificate until the certificate has been surrendered to the corporation. Within a reasonable time after the issuance or transfer of uncertificated shares, the corporation shall send the registered owner thereof a written notice of all information that would appear on a certificate. Except as otherwise expressly provided by law, the rights and obligations of the holders of uncertificated shares shall be identical to those of the holders of certificates representing shares of the same class and series.

The name and address of each shareholder, the number and class of shares held and the date on which the shares were issued shall be entered on the books of the corporation. The person in whose name shares stand on the books of the corporation shall be deemed the owner thereof for all purposes as regards the corporation.

SECTION 2. LOST CERTIFICATES. If a certificate representing shares has allegedly been lost or destroyed the board of directors may in its discretion, except as may be required by law, direct that a new certificate be issued upon such indemnification and other reasonable requirements as it may impose.

SECTION 3. TRANSFERS OF SHARES. Transfer of shares of the corporation shall be recorded on the books of the corporation. Transfer of shares represented by a certificate, except in the case of a lost or destroyed certificate, shall be made on surrender for cancellation of the certificate for such shares. A certificate presented for transfer must be duly endorsed and accompanied by proper guaranty of signature and other appropriate assurances that the endorsement is effective. Transfer of an uncertificated share shall be made on receipt by the corporation of an instruction from the registered owner or other appropriate person. The instruction shall be in writing or a communication in such form as may be agreed upon in writing by the corporation.

ARTICLE VII

FISCAL YEAR

The fiscal year of the corporation shall be fixed by resolution of the board of directors.

ARTICLE VIII

DISTRIBUTIONS

The board of directors may authorize, and the corporation may make, distributions to its shareholders, subject to any restrictions in its articles of incorporation or provided by law.

ARTICLE IX

SEAL

The corporate seal shall have inscribed thereon the name of the corporation and the words "Corporate Seal, Illinois." The seal may be used by causing it or a facsimile thereof to be impressed or affixed or in any other manner reproduced, provided that the affixing of the corporate seal to an instrument shall not give the instrument additional force or effect, or change the construction thereof, and the use of the corporate seal is not mandatory.

ARTICLE X

WAIVER OF NOTICE

Whenever any notice is required to be given under the provisions of these by-laws or under the provisions of the articles of incorporation or under the provisions of The Business Corporation Act of the State of Illinois, a waiver thereof in writing, signed by the person or persons entitled to such notice, whether before or after the time stated therein, shall be deemed equivalent to the giving of such notice. Attendance at any meeting shall constitute waiver of notice thereof unless the person at the meeting objects to the holding of the meeting because proper notice was not given.

ARTICLE XIINDEMNIFICATION OF OFFICERS,
DIRECTORS, EMPLOYEES AND AGENTS

SECTION 1. The corporation shall indemnify any person who was or is a party or is threatened to be made a party to any threatened, pending or completed action, suit or proceeding, whether civil, criminal, administrative or investigative (other than an action by or in the right of the corporation) by reason of the fact that such person is or was a director, officer, employee or agent of the corporation, partnership, joint venture, trust or other enterprise, against expenses (including attorneys' fees), judgments, fines and amounts paid in settlement actually and reasonably incurred by such person in connection with such action, suit or proceeding if he acted in good faith and in a manner he reasonably believed to be in or not opposed to the best interests of the corporation, and, with respect to any criminal action or proceeding, had no reasonable cause to believe his or her conduct was unlawful. The termination of any action, suit or proceeding by judgment or settlement, conviction or upon a plea of nolo contendere or its equivalent, shall not, of itself, create a presumption that the person did not act in good faith and in a manner which he or she reasonably believed to be in or not opposed to the best interest of the corporation, and with respect to any criminal action or proceeding, had reasonable cause to believe that his conduct was unlawful.

SECTION 2. The corporation shall indemnify any person who was or is a party or is threatened to be made a party to any threatened, pending or completed action or suit by or in the right of the corporation to procure a judgment in its favor by reason of the fact that such person is or was a director, officer, employee or agent of the corporation, or is or was serving at the request of the corporation as a director, officer, employee or agent of another corporation, partnership, joint venture, trust or other enterprise against expenses (including attorneys' fees) actually and reasonably incurred by such person in connection with the defense or settlement of such action or suit if he or she acted in good faith and in a manner he or she reasonably believed to be in or not opposed to the best interests of the corporation and except that no indemnification shall be made in respect of any claim, issue or matter as to which such person shall have been adjudged to be liable for negligence or misconduct in the performance of his duty to the corporation unless and only to the extent that the court in which such action or suit was brought shall determine upon application that despite the adjudication of liability but in view of all the circumstances of the case, such person is fairly and reasonably entitled to indemnity for such expenses which the court shall deem proper.

SECTION 3. To the extent that a director, officer, employee or agent of a corporation has been successful, on the merits or otherwise, in the defense of any action, suit or proceeding