United States Patent [19]

Phillips

[11] **3,837,639**

[45] **Sept. 24, 1974**

[54] **FREE JET RECORD SEPARATOR**

[75] Inventor: **Edwin R. Phillips,** Rosemont, Pa.

[73] Assignee: **Sperry Rand Corporation,** New York, N.Y.

[22] Filed: **June 22, 1973**

[21] Appl. No.: **372,545**

[52] **U.S. Cl.** **271/105,** 271/145, 209/80.5

[51] **Int. Cl.** **B65h**

[58] **Field of Search** 209/80.5, 110.5; 239/597; 271/105, 97, 98, 145

[56] **References Cited**

UNITED STATES PATENTS

3,228,130	1/1966	Novak	209/110.5 X
3,292,630	12/1966	Paulus	209/80.5
3,339,849	9/1967	Paulus	209/80.5 X

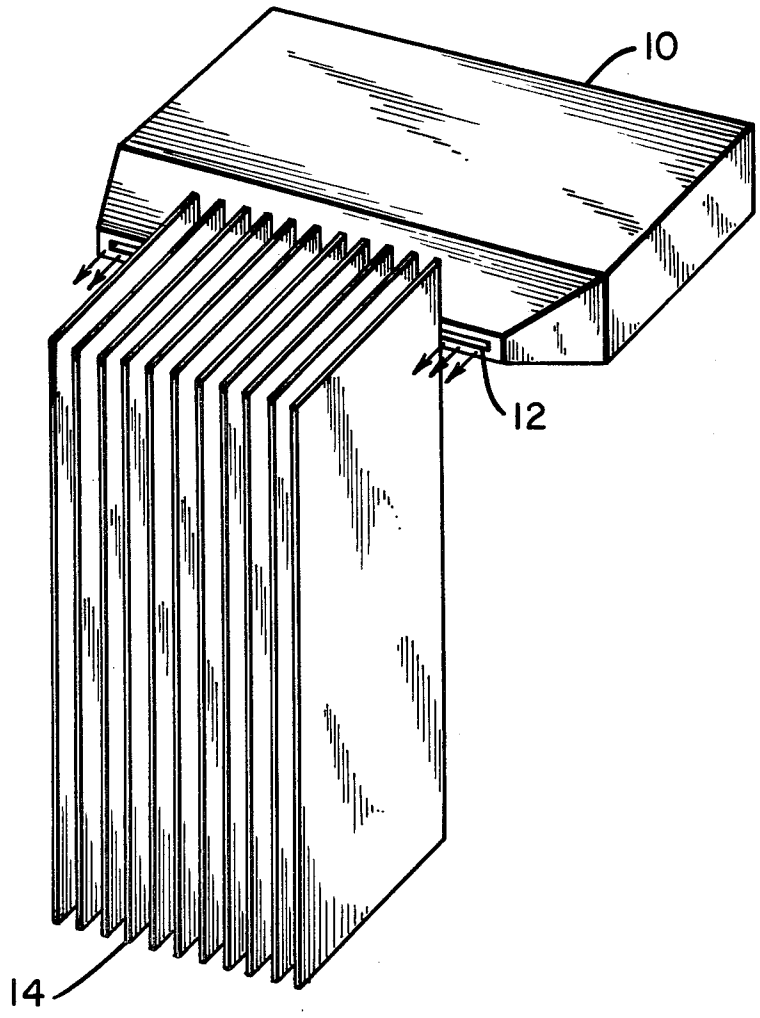
Primary Examiner—Allen N. Knowles

Attorney, Agent, or Firm—Rene A. Kuypers

[57] **ABSTRACT**

The invention discloses a fluffing arrangement to provide separation between the records contained in a cartridge in order to facilitate random removal of an individual record. A free jet of low pressure directly impinges on the deck to maintain separation between the records.

7 Claims, 4 Drawing Figures



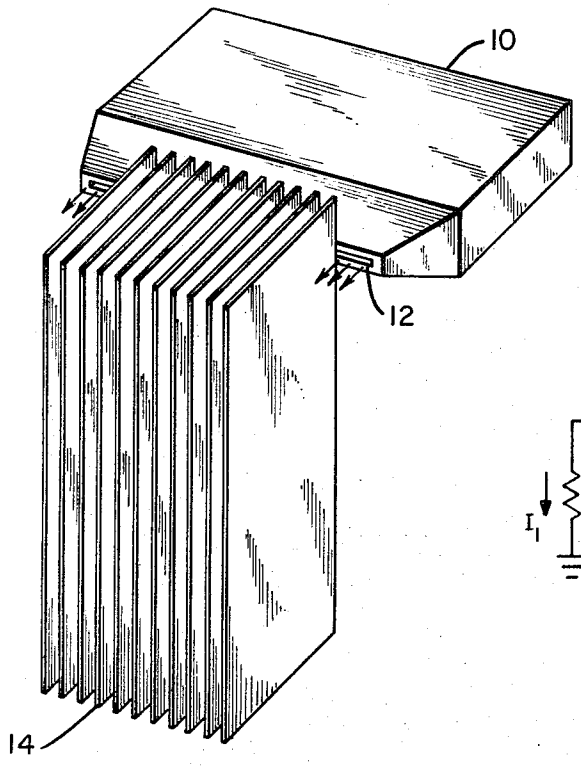


Fig. 1

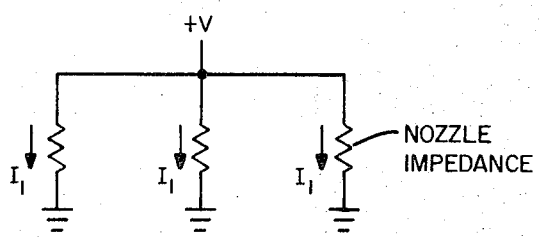
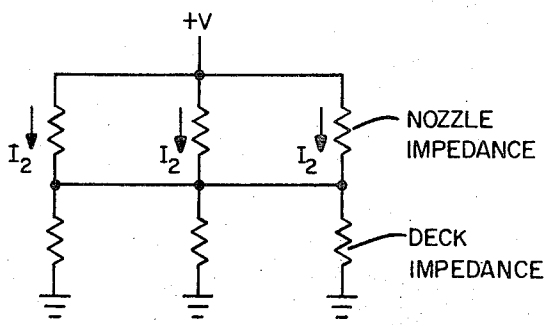
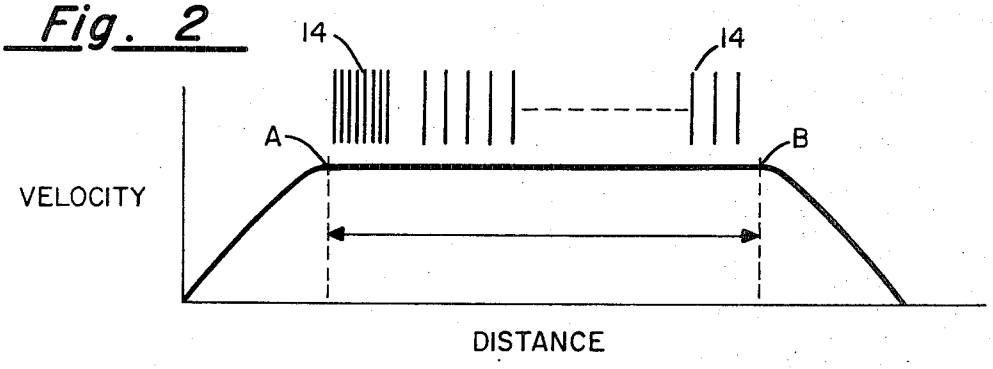


Fig. 3



(PRIOR ART) Fig. 4

Fig. 2



FREE JET RECORD SEPARATOR

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to the field of pneumatics and in particular to the field of pneumatic file separators wherein the records of the file are in a close side-by-side relationship.

2. Description of the Prior Art

Known prior art patents and publications made of record are patents U.S. Pat. Nos. 3,191,612 and 3,334,640, which are prior art examples of a free jet in operation, and patents U.S. Pat. Nos. 3,465,879, 3,584,742, 3,726,516 and a publication entitled "High-Performance NCR Cram" by R. K. Gerlach, Nov. 1966, publication 4,775 which relate to pneumatic card separators.

The major shortcoming of the prior art card fluffing arrangements has been their high power consumption necessitated by the use of high pressure pumps, compressors and enclosed chambers. High pressure pumps and compressors have serious shortcomings because they have limited life and reliability. The pressurized plenum chambers as used in the prior art not only have a requirement for being air tight as exemplified by the Bukovich patent and the Gerlach publication, but it was also expensive as can be appreciated in the elaborate conduit arrangement of Jones.

Another recognized shortcoming of the known prior art such as disclosed in U.S. Pat. Nos. 3,584,742 is that the pump was load sensitive. This resulted in a non-constant separating force being applied to the deck. In other words, when a record was removed from the deck, there was a tendency for the pressurized air to flow through the low impedance opening. Accordingly, more air flowed through the low impedance opening so that less air was provided for maintaining the necessary separating force to the remaining records of the deck. Consequently, there was a tendency for the cards in the deck in this system to bunch up so that there was difficulty in a random selection process of a record.

SUMMARY OF THE INVENTION

The invention discloses a free jet technique for providing a uniform separating force to a deck containing a plurality of records. The free jet by appropriate spacing in front of the deck allows the velocity of the jet to be converted into a pressure head at the edge of the records so that each record is forced into an equal separation from adjacent records. The free jet approach for record separation does not require an air tight enclosure to maintain a constant separating force between the individual records of the deck.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a view of the free jet used in conjunction with a record deck;

FIG. **2** is a velocity profile with respect to distance along the free jet as utilized in this invention;

FIG. **3** is an electrical analog representative of the instant invention; and

FIG. **4** is an electrical analog representative of the known prior art.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to FIG. **1**, there is disclosed the arrangement of the instant invention wherein a blower **10** is shown located behind the deck or cartridge of record members **14.** The blower **10** provides an air pressure of approximately 0.25psi.. In the preferred the record members of which there are 1,043 in a deck are approximately 21 inches long by 5 1/4 inches wide and 5 mil thick. The record members are iron-oxide covered Mylar sheets which are suitable for magnetic recording and reading. Such a recording scheme is disclosed in patent application, serial number 317,814, filed 12/22/72. The records **14** are held in position by selection rods (not shown) in the manner depicted in the cited prior art publication. The deck **14** of individual record members is removable (not sbown) such that another deck may be readily substituted in its place. The members **14** are coded in a manner that by a rotation of certain of the selection rods a random card selection can be made. After the random card selection, the member **14** is allowed to fall by gravity into a transport (not shown) for transfer to the read-write station. Since the selected member **14** is designed to drop by gravity, the frictional level between adjacent cards must be zero. The uniform separating force produced by this invention achieves essentially this zero friction.

A free jet **12** of low pressure but high flow air emanating from the blower **10** is located behind the deck so that it impinges on the back side of records **14.** By free jet is meant that the nozzle of the jet is located between 1-2½ nozzle widths (1.e., the height of the jet **12**) away from the back edge of records. In the preferred embodiment, the distance of the nozzle from the rear of the deck is approximately one nozzle width. Accordingly, the fluid from the jet travels through ambient air to the deck. By locating the free jet at this distance, the jet will provide no less than 80 percent of its power output at the deck. It should be noted that the length of the jet extends beyond the edge of the record deck. This provides a separating force in the vicinity of the end records of the deck **14** and the cartridge frame (not shown) so that the tendency noted in the prior art for these records to be forced against the frame is obviated.

The fluid flow developed by the free jet does not recognize as it travels to the deck **14** what type of loading is provided by the deck **14.** In other words, the free jet does not know whether bunching of the cards has occurred (the case during start-up after loading a new deck), or whether individual cards are missing due to certain ones being processed in a read-write station. Therefore, as long as the fluid flow from the jet sees an ambient pressure as it travels to the deck, it will not be affected by the downstream loading. This downstream loading of a free jet may be compared to a hose which directs a stream of water into a pail of water. If the stream is directed into the bucket from a distance, the stream will be unaffected by the amount of water in the pail so that the hose is not load sensitive. However, if the hose nozzle is placed under an existing water level in the pail, the stream will be affected and hence will be load sensitive.

The free jet **12** utilized with the deck **12** provides for a potential uniform separating force field irrespective

of the type of loading provided by the deck. This aspect of the invention may be appreciated more fully by referring to FIG. **2**. FIG. **2** represents the velocity profile of the free jet output with respect to the horizontal distance along the nozzle. The distance A-B represented between the dotted lines is the width of the free jet **12** and extends a short distance beyond the extremities of the deck **14**. The deck **14** is superimposed over the constant velocity section of the curve for explanatory purposes only.

Referring to the deck **14** shown in FIG. **2**, let it be assumed that when it is first placed into position, there is a bunching of some of the records on the left hand side such that there is an uneven spacing. The right hand side of the deck **14** is assumed to have a proper spacing of the members. The operation of the free jet **12** is such that the kinetic energy produced by the fluid velocity is converted into a static pressure in accordance with the formula, $P_s = \rho \frac{1}{2} V^2$ wherein ρ is the density of air. This static pressure build-up takes place in front of the bunched records on the left hand side. The static pressure head built up in front of the bunched records causes them to blow apart so that they rapidly assume an equal separation with other records without any appreciable time lag. Furthermore, the velocity of fluid flowing into the large opening in the deck will not increase and will remain constant with the fluid flow throughout the remaining section of the deck.

This feature may be further exemplified by referring to FIG. **3** wherein the electrical analog of the instant invention is shown. The analog indicates that the free jet may be represented by a group of parallel resistors. The electrical analog indicates that the load I_1 (fluid flow from the jet) is a function only of the nozzle impedance and the voltage V (jet pressure). It is apparent from the analog that the condition of the deck **14** (i.e., deck loading) is not a parameter which affects the performance of the free jet, and therefore its velocity is constant as shown in FIG. **2**.

The prior art electrical analog is depicted in FIG. **4** wherein the nozzle impedance is shown as a fixed resistance, but the deck loading is also represented by a resistance. In other words, this analog represents that the load I_2 or fluid flow is a function not only of the nozzle impedance but also of the deck loading. This may be better understood by referring again to FIG. **2**. Thus, in a prior art deck arrangement shown in FIG. **2**, there is a tendency of the pressurized air chamber to develop eddy currents which flow through the low impedance opening provided in the deck. This tendency of the fluid flow is shown by the analog wherein there is a cross-coupling between the various resistors. This indicates that if a low impedance is present in one of the resistors, more of the branch currents I_2 will flow through the low impedance path to ground.

The instant invention provides additional improvements in addition to those discussed above. Thus, since less energy is required for operation over the prior art, the system is less noisy and produces less vibration. Furthermore, since less energy is expended less heating is produced.

What is claimed is:

1. A card fluffing arrangement comprising,

a. a plurality of flat record members arranged in a side by side suspended relationship in a non-enclosed area,

b. a pneumatic free jet including a nozzle means which is located between 1-2½ nozzle diameters from said records and facing in the direction of said record edges such that the widest dimension of the nozzle opening is positioned across the edges of said plurality of flat record members

c. said nozzle means of the free jet providing a constant separation force between said respective records so that a selected record member may readily fall by gravity.

2. A card fluffing arrangement in accordance with claim **1** wherein said record members are flexible on the order of 5 mil thick.

3. A card fluffing arrangement in accordance wwth claim **2** wherein said flexible record members are made of oxide covered Mylar.

4. A card fluffing arrangement in accordance with claim **1** wherein said free jet is powered by a blower.

5. A card fluffing arrangement in accordance with claim **4** wherein said blower operates at about 0.25 psi..

6. A card fluffing arrangement in accordance with claim **1** wherein the length of said free jet extends a short distance beyond the end records of said members.

7. The method of fluffing a deck of non-enclosed and suspended documents comprising the steps of,

a. providing a pneumatic jet having a nozzle which is oriented across the edges of said documents;

b. orienting the jet nozzle with respect to said edges in order to supply at least **80%** of its power to the deck;

c. the nozzle of said jet providing a constant separating force to said suspended documents.

* * * * *