

March 22, 1966

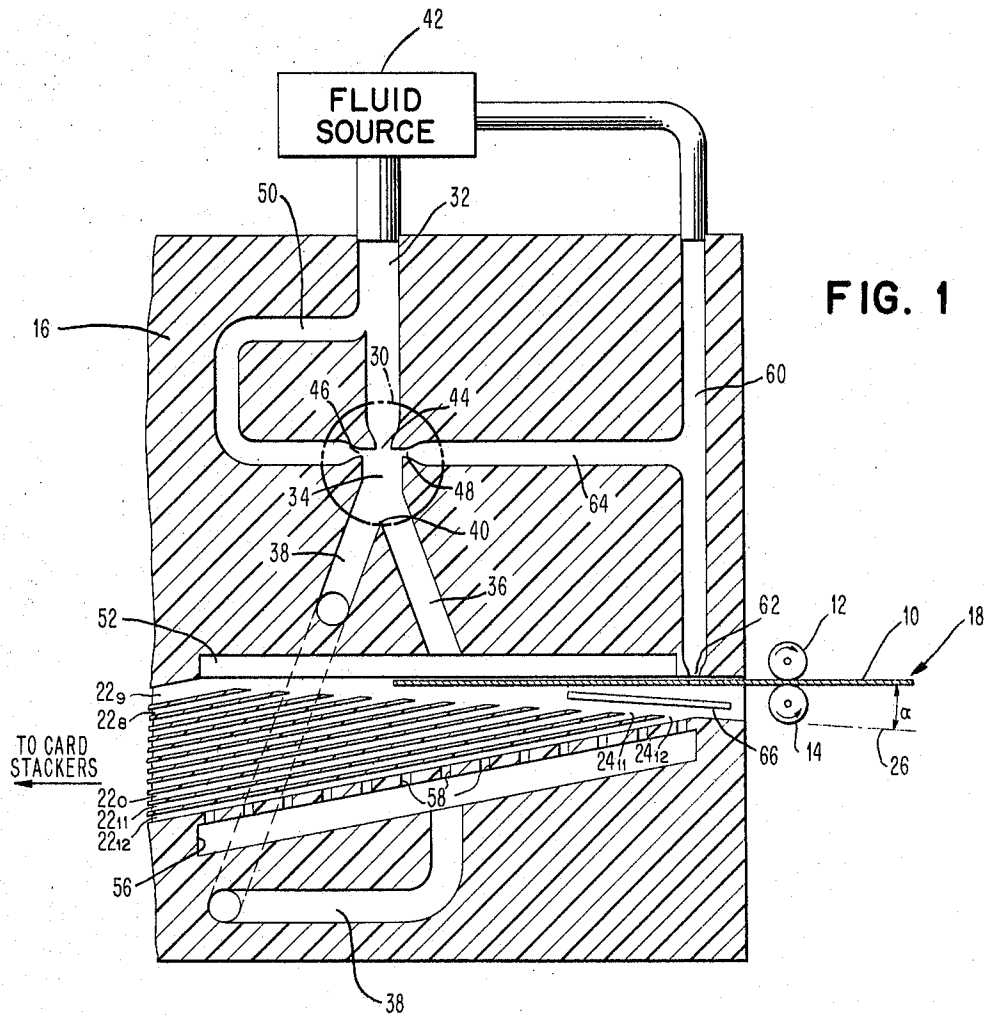
A. SCHONFELD ET AL.

3,241,669

FLUID SORTER

Filed Aug. 17, 1964

2 Sheets-Sheet 1



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FIG. 2

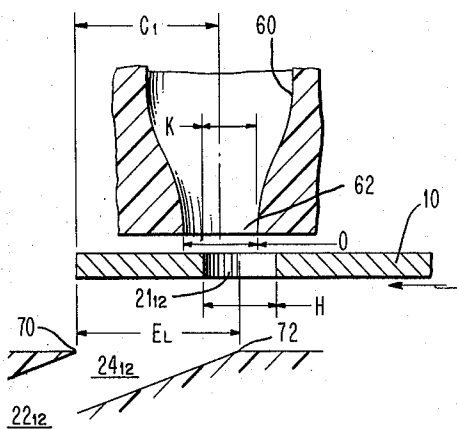
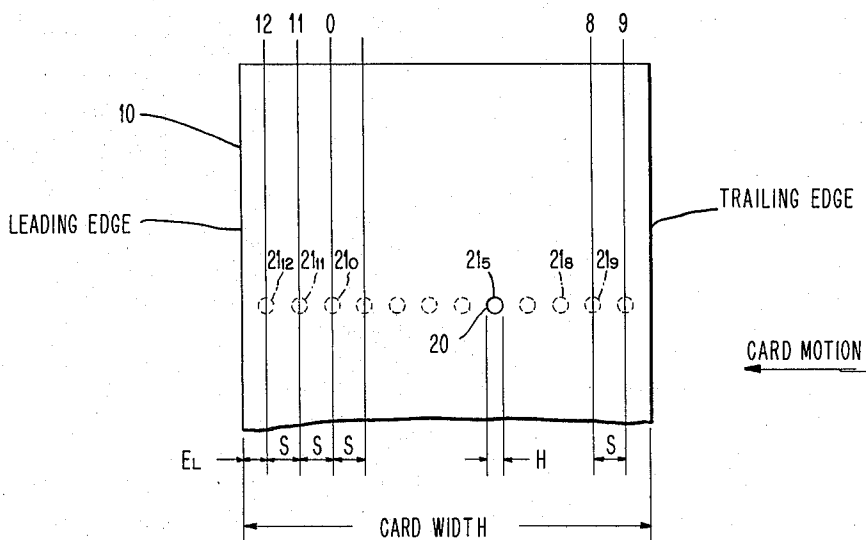


FIG. 3a

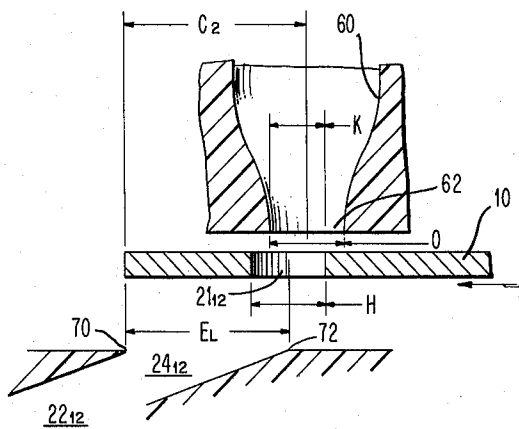


FIG. 3b

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3,241,669

FLUID SORTER

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This invention relates to sorting apparatus for punched record cards or the like, and more particularly, relates to structure wherein both the sensing and deflecting functions are performed by the use of pure fluid means.

Prior art sorting devices usually operate on mechanical or electromechanical principles for sensing and/or subsequently deflecting a record card into any one of a plurality of card collecting channels according to the location of perforations in the particular column being sorted upon. For example, in one typical prior art structure the hole sensing function is performed by electrical means, wherein a perforation in the card permits the closing of brush contacts to thereafter mechanically displace a particular chute blade in order to admit the card into a particular channel from whence it is conveyed to a card stacker or hopper. Such mechanical features obviously are limited in speed because of the inertia of the moving chute blade parts, and further require rather complex electrical circuitry to perform the sensing and actuating functions. The present invention obviates the above undesirable characteristics of such prior art sorters by utilizing fluid hole sensing means to selectively actuate a pure fluid amplifier which then deflects the moving record card from its normal path into a particular one of a plurality of card collecting channels. There are no moving mechanical parts whatsoever except for possibly the card transport means. Pure fluid amplifiers are a relatively new development based on the principle that a relatively high energy fluid stream (commonly called the power stream) can be deflected without losing its integrity, although with some power loss, into a selected one or more of several different output channels by means of a fluid control stream of lesser energy. Such an amplifier requires no moving parts and yet exhibits amplification because of the change in power stream fluid energy flowing in a particular output channel caused by the lesser energy control input signal.

Therefore, one object of the present invention is to provide a fluid sorter utilizing a pure fluid amplifier to deflect the card into any one of a plurality of sorting channels according to the presence of a perforation which can be punched in any one of a plurality of code hole positions.

Another object of the present invention is to provide a sorting device wherein the sensing of the perforation location is accomplished by non-moving fluid means which in turn selectively activates a pure fluid amplifier for the subsequent sort operation.

A further object of the present invention is to provide sorting apparatus which includes pure fluid amplifier means having one of its power stream output channels located adjacent to the card path for deflecting the card into a card sort channel, together with variable control fluid energy generating means connected to the fluid amplifier and having a fluid orifice located adjacent to card path for determining the location of a perforation in said card.

These and other objects of the present invention will become apparent during the course of the following description to be read in view of the drawings, in which:

FIGURE 1 shows a sectional view of a preferred embodiment of the invention;

FIGURE 2 illustrates a sorting column on a typical record card; and

FIGURES 3A and 3B illustrate the various factors to be

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considered in the location of the fluid orifice sensing means relative to the card collecting channels.

Referring now to FIGURES 1 and 2, a record card 10 is shown being given leftward motion by card transport means such as rollers 12 and 14 so that it enters a card sort station 16 in an initially undeflected direction along a card path 18. As best shown in FIGURE 2, card 10 is generally rectangular in shape whose length is divided into a plurality of character columns, for example eighty or ninety, with each column in turn having a plurality of code hole positions therein generally twelve in number. Thus, while the longer dimension (i.e. the length of the card) is divided into columns, the shorter dimension (i.e. the card width) is divided into twelve rows numbered 0 through 12 in the manner shown in FIGURE 2. Within each card column a perforation 20 can be punched in any one of its code hole positions 21₀-21₁₂ in order to represent either a numerical digit or a zone position (rows 0, 11, and 12) in accordance with the particular code being utilized to represent a single character in said card column. For alphabetic characters, it is customary to place two perforations in a column, one in a zone row 0, 11, or 12, and the other in one of the remaining digit rows 1 through 9. However, in FIGURE 2, only one perforation 20 is shown in the card column illustrated. The code hole positions in a column are usually arranged with their centers equally spaced apart a distance represented by S in FIGURE 2, with there also being a predetermined distance E_L between the leading edge of the card, as measured in the direction of card motion, and the center of the code hole position closest thereto which, in the case of FIGURE 2, is the row 12 position 21₁₂.

Returning now to FIGURE 1, sort station 16 includes a plurality of card sorting channels 22₁₂, 22₁₁, and 22₀-22₉, inclusive arranged in that order with respect to the direction of card motion. These channels may be constructed by a plurality of leaf separator plates so as to reduce the wall thickness between channels to a minimum. Each card channel has a respective opening or mouth 24₁₂, 24₁₁, etc. for receiving a record card, and is further adapted for connection at its other end to any card stacker of a well known type. Each card collecting channel 22 is preferably branched from the initial card path 18 at a small angle in order to reduce the degree of card deflection required for entry therein. Furthermore, the openings 24 of the card channels are preferably situated in a plane 26 which makes, with the original card path 18, a small angle α (in the manner shown in FIGURE 1) which is useful also in facilitating the entry of a card into a channel. Where the code hole positions on a card have their centers equally spaced apart as shown in FIGURE 2, then the centers of the card collecting openings 24 should also be equally spaced apart the distance S.

A pure fluid amplifier configuration, generally indicated by numeral 30, is included as one element of the sorter combination. Amplifier 30 is comprised of a power stream input channel 32, a fluid interaction chamber 34, and power stream output channels 36 and 38 which branch from said chamber 34 in the manner shown and which are together at a divider tip 40. A source 42 is provided to supply power stream input channel 32 with relatively high energy fluid (generally air) which in turn exits through a nozzle 44 into chamber 34 for subsequent deflection into either one of the power stream output channels. This is accomplished in the preferred embodiment by means of two control stream input channels 46 and 48 which enter chamber 34 on opposite sides thereof for respectively controlling the deflection of the power stream into output channels 36 and 38. Control stream input channel 46 in turn is connected by a fluid conduit 50 to the power stream input channel 32 so as to be provided with a continuous source of biasing fluid which is-

sues as a lower energy control jet into chamber 34 to there impinge upon the power jet from nozzle 44. This channel 46 control jet tends to deflect the power stream to the right so as to make the latter exit from chamber 34 via output channel 36. Channel 36 in turn exhausts into a region 52 adjacent to the side of card path 18 opposite from channel openings 24. The existence of high energy power stream flow in channel 36 therefore creates, by both dynamic and static effects, a fluid pressure differential across card 10 which is directed downward so as to deflect the card leading edge into the channel opening 24 over which said edge is moving at the time that power stream flow is initiated in channel 36. The other output channel 38 of the fluid amplifier is preferably connected to exhaust into a region 56 which is adjacent card path 18 on the side opposite from region 52, or in other words, on the same side of the card path where are located channel openings 24. When power stream flow occurs in output channel 38, there is a pressure built up in region 56 which is communicated to the underside of the card 10 via apertures or ports 58 and similar ports in the leaf separators so as to create a pressure differential tending to maintain card 10 in its original undeflected card path 18. Where the width of each leaf separator is less than the length of the card (as is the case for the typical prior art chute blade), then apertures therein are not necessary since the fluid can flow around them. Alternatively, power stream output channel 38 may be connected only to exhaust to atmosphere rather than to region 56 if the card position in card path 18 is normally maintained in the absence of positive pressure in region 52.

Fluid amplifier 30 is designed by well known techniques such that the biasing control fluid in control channel 46 is sufficient to maintain power stream flow in output channel 36 only as long as any control fluid energy applied to channel 48 is below some designated predetermined threshold value. When the control fluid energy applied to channel 48 becomes equal to or above said predetermined threshold value, then it opposes and overcomes the biasing fluid energy from channel 46 in a manner to switch power stream flow away from channel 36 and into output channel 38 where flow remains as long as signal fluid of sufficient energy is applied to channel 48. The amplifier preferably is designed with boundary layer lock on in each output channel 36 and 38 so that rapid flip-flop action occurs when power stream flow is switched from either output channel to the other. With this configuration, power stream flow would actually be stable in either output channel to which it is deflected if all control fluid activity from both channels 46 and 48 were to be subsequently discontinued.

The manner in which the fluid energy in control input channel 48 is varied is provided by the following structure. A fluid channel 60 has one end connected to a source of control fluid (which may be source 42) and its other end connected to a nozzle or orifice 62 which is located adjacent the same side of card path 18 as region 52. Another fluid channel 64 has one of its ends connected to channel 60 intermediate the latter's two ends, while the other end of channel 64 is connected to control input channel 48 of pure fluid amplifier 30. The principal advantage of this orifice 62 location is that the control air supplied to channel 48 cannot be contaminated by dust or the like which might be carried by the card perforation. It may thus be observed that when the flow area of orifice 62 is substantially blocked, as by the presence of an imperforate card surface adjacent thereto, much, if not all, of the control fluid entering channel 60 is diverted into control channel 48 so as to increase the fluid energy of the control stream issuing therefrom into chamber 34. On the other hand, if orifice 62 is substantially unblocked by either the absence of a card in sort station 16 or by the alignment of a card perforation therewith, an escape route is provided for the fluid in channel 60 so as to decrease the energy of the fluid in control channel 48 below said

threshold value to thereby permit biasing fluid from channel 46 to switch power stream flow back into output channel 36. However, it should be added here that although the use of continuously applied biasing fluid from channel 46 is desirable because it insures the positive resetting of power stream flow through channel 36 in the absence of sufficient control fluid energy in channel 48, a fluid amplifier could be employed wherein said resetting is instead effected by the asymmetrical orientation of its power stream output channels and/or divider tip location. Such an alternative amplifier could, for example, have its output channel 36 directly in line with the power stream input channel 32 so that the natural undeflected path of power stream flow would be there-through, with channel 48 control energy then causing a power stream deflection to the other output channel 38 which in turn would be designed without any stable flow characteristic.

The operation of FIGURE 1 in general is seen to be the following. When record card 10 enters sort station 16, it moves along card path 18 until such time as the first perforation in the column is aligned with orifice 62. Between the time of card entry and the time of perforation alignment, orifice 62 is substantially blocked so as to increase the fluid energy in channel 48 above the threshold value specified above. This means that as long as an imperforate portion of the card column is opposite orifice 62, the fluid amplifier power stream flow is through channel 38 rather than channel 36 so as to maintain card 10 in its initial undeflected path to prevent its entry into any one of the card collecting channels. When the perforation finally becomes aligned with orifice 62, the fluid energy in control channel 48 becomes less than said threshold value, thus permitting the biasing fluid in channel 46 to switch power stream flow into channel 36. This operation now deflects at least the leading edge of card 10 downwardly into the mouth 24 of that card collecting channel which is uniquely identified with the code hole position in which the perforation is found. The card traverses the selected channel 22 until it arrives at the card stacker or hopper, or other utilization means connected therewith.

Although this apparatus normally sorts on the first perforation in a column to become aligned with orifice 62, a perforation in any zone row position 0, 11, and 12 may be effectively ignored by using a plate or barrier 66 which can be selectively inserted into sort station 16 to cover the first three channel openings 24₁₂, 24₁₁ and 24₀. Therefore, alphanumeric code sorting (where there are two perforations per column) can be performed by first passing a record card through station 16 without using plate 66 so as to deflect the card into one of the three channels 22₁₂, 22₁₁, or 22₀ and then passing the same card once more with plate 66 inserted so as to determine in which now 2-9 the perforation exists.

FIGURES 3A and 3B show various dimensional criteria which should be considered in determining the spacing of orifice 62 from the first card collecting opening 24₁₂. Said card opening 24₁₂ may be considered to have a front edge 70 and a rear edge 72 as measured in the direction of card motion. The leading code hole position, that in row 12, is shown to have its center a distance E_L from the leading edge of card 10 and is of a size H as measured in the direction of card motion. Orifice 62 is represented as being of a size O measured in the direction of card motion, and has its center spaced a distance C from the front edge 70 of opening 24₁₂. For the purpose of this discussion, it is assumed that orifice 62 must be unblocked or uncovered at least some minimum distance K in order that the fluid energy applied to control channel 48 be below said predetermined threshold value. Distance K may in fact be as large as the entire size O of the orifice, or may be smaller than that shown in FIGURE 3A. When distance K is less than size O of the orifice, the fluid energy in control channel 48 will

be below said predetermined threshold level for more than one unique position of card 10 relative to orifice 62. Thus, if a perforation exists in the row 12 position of the column being sorted upon, it will be observed that the distance C, between the front edge 70 of card collecting opening 24₁₂ and the center line of orifice 62, can be within the range of values next to be discussed. The minimum distance C₁ is one wherein the leading card edge immediately abuts against front edge 70 when the card is deflected into channel 24₁₂. That is to say, FIGURE 3A shows a situation wherein a row 12 perforation has become sufficiently aligned with orifice 62 so that the latter is unblocked by a distance K (measured in the line of card motion) such that power stream flow in channel 36 causes the leading card edge to be deflected downwardly. Said leading card edge must not be beyond or to the left of front edge 70 of opening 24₁₂ since otherwise it could not enter therein. The minimum distance C₁ may be easily calculated from Formula 1 given below:

$$(1) \quad C_1 = E_L - \frac{1}{2}H + K - \frac{1}{2}O = E_L + K - \frac{1}{2}(H + O)$$

Front edge 70 of card collecting opening 24₁₂ may actually be spaced further away than C₁ from the center line of orifice 62 whenever distance K is less than size O. The maximum distance C₂ is shown in FIGURE 3B to be at the point where the minimum required distance K exists for the last possible position of the card as it moves to the left. If front edge 70 were further left of its position in FIGURE 3B, then fluid deflection of the card leading edge would no longer be present at the time that said leading card edge comes opposite front edge 70 in which case the card leading edge would have been deflected first downwardly then upwardly so as to have missed being guided into and entrapped by collecting channel 22₁₂. The maximum distance C₂ can easily be calculated from the following Formula 2:

$$(2) \quad C_2 = E_L + \frac{1}{2}H - K + \frac{1}{2}O = E_L - K + \frac{1}{2}(H + O)$$

It may thus be said that the distance C between the front edge 70 and the center line of orifice 62 can be ideally located within the range given by Formula 3 below:

$$(3) \quad E_L + K - \frac{1}{2}(H + O) \leq C \leq E_L - K + \frac{1}{2}(H + O)$$

Of course, the above dimensional analysis is ideal, in that any time lapse between the change in flow area at orifice 62 and the actual change in the pressure gradient across card 10 must be taken into account relative to the velocity of card motion through the sort station. Therefore, the above Formulas 1, 2, and 3 are only useful to provide preliminary design values.

While a preferred embodiment of the present invention has been shown and described, modifications may be made thereto which are within the scope of persons skilled in the art without departure from the novel principles defined in the appended claims.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. Fluid apparatus for sorting on a record card moving in an initially undeflected direction through a card path, said sorting being performed according to the presence of a perforation which can be punched in any one of a plurality of code hole positions arranged on the card in a column parallel to the direction of card motion between leading and trailing card edges, which comprises:

- (a) a plurality of card collecting channels each having a first opening for receiving a record card, and a second opening adapted for connection with card utilization means individual thereto, with all of said first openings being located adjacent to a same one side of the card path and arranged in a column parallel to the direction of card motion;
- (b) pure fluid amplifier means including in combination a power stream input channel and power

stream source therefor, a fluid interaction chamber, control fluid input means, and first and second power stream output channels, said pure fluid amplifier means connected with its said first power stream output channel exhausting to a region adjacent to the opposite side of the card path such that power stream flow therein deflects at least the leading edge of a moving record card towards said first openings in order that the record card can enter any one of said card collecting channels, where said pure fluid amplifier means is responsive to control fluid applied to its said control fluid input means of energy below a predetermined threshold value for causing power stream flow in its said first power stream output channel, and of energy equal to and above said predetermined threshold value for causing power stream flow in its said second power stream output channel; and

(c) variable control fluid energy generating means connected to said control fluid input means and including an output fluid orifice, said energy generating means producing control fluid energy below said predetermined threshold value in response to the substantial unblocking of its said fluid orifice and producing control fluid energy equal to and above said predetermined threshold value in response to the substantial blocking of its said fluid orifice, where said fluid orifice is located adjacent the said opposite side of said card path such that it is reached first and is thereafter substantially blocked by a record card until a said perforation therein comes into alignment therewith.

2. Apparatus according to claim 1 for sorting on a record card whose perforation is of a predetermined first size as measured in the direction of card motion and whose code hole positions have centers equally spaced apart a predetermined first distance with there being a predetermined second distance between the card leading edge and the center of the nearest code hole position; wherein said first openings have centers equally spaced apart said first distance and each is defined in part by front and rear edges as measured in the direction of card motion, said output fluid orifice is of a predetermined second size as measured in the direction of card motion with said control fluid energy being below, or equal to and above, said predetermined threshold value in response to the unblocking of said orifice by an amount equal to and more than, or less than, respectively, a predetermined third distance as measured in the direction of card motion, and wherein said fluid orifice is spaced a predetermined fourth distance from the front edge of that first opening initially reached by a moving record card which lies within a range of values bounded by one terminal value approximately equal to said second distance plus said third distance less one-half said first size less one-half said second size and by another terminal value approximately equal to said second distance plus one-half said first size plus one-half said second size less said third distance.

3. Apparatus according to claim 1 wherein said plurality of first openings lie in a plane making with the plane of said card path a small acute angle whose apex lies in front that first opening finally reached by an undeflected moving record card.

4. Apparatus according to claim 1 wherein said plurality of first openings are located at different distances away from said card path.

5. Apparatus according to claim 1 wherein said pure fluid amplifier means has its said second power stream output channel exhausting to a region adjacent to said one side of the card path such that power stream flow therein prevents a moving record card from inadvertently entering any of said card collecting channels.

6. Apparatus according to claim 1 wherein said variable control fluid energy generating means comprises a control

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fluid source, a first control fluid channel having one end connected to said control fluid source and the other end connected to said fluid orifice, and a second control fluid channel having one end connected to an intermediate point on said first control fluid channel and its other end connected to said fluid amplifier control fluid input means.

7. Apparatus according to claim 1 wherein is further included barrier means selectively movable to cover certain ones of said plurality of first openings in order to prevent a moving record card from entering the associated card collecting channels.

8. Apparatus according to claim 7 wherein said barrier means is selectively movable to cover those first openings which are initially reached by a moving record card.

9. Fluid apparatus for sorting on a record card moving in an initially undeflected direction through a card path, said sorting being performed according to the presence of a perforation which can be punched in any one of a plurality of code hole positions arranged on the card in a column parallel to the direction of card motion between leading and trailing card edges, which comprises:

(a) a plurality of card collecting channels each having a first opening for receiving a record card, and a second opening adapted for connection with card utilization means individual thereto, with all of said first openings being located adjacent to a same one side of the card path and arranged in a column parallel to the direction of card motion;

(b) a pure fluid amplifier having a power stream input channel and power stream source therefor, a fluid interaction chamber, first and second power stream output channels, and first and second control stream input channels for respectively deflecting the power stream into said first or said second power stream output channel, said pure fluid amplifier being connected with its said first power stream output channel exhausting to a region adjacent to the opposite side of the card path such that power stream flow therein deflects at least the leading edge of a moving record card toward said first openings in order that the record card can enter any one of said card collecting channels.

(c) means to apply biasing control fluid to said first control stream input channel of energy such that said fluid amplifier is responsive to control fluid applied to its said second control stream input channel of energy below a predetermined threshold value for causing power stream flow in its said first power stream output channel, and of energy equal to and above said predetermined threshold value for causing power stream flow in its said second power stream output channel; and

(d) variable control fluid energy generating means connected to said second control stream input channel and including an output fluid orifice, said energy generating means applying thereto control fluid of energy below said predetermined threshold value in response to the substantial unblocking of its said fluid orifice and applying thereto control fluid energy equal to and above said predetermined threshold value in response to the substantial blocking of its said fluid orifice, where said fluid orifice is located adjacent the said opposite side of said card path such that it is reached first and is thereafter substantially blocked by a record card until a perforation therein comes into alignment therewith.

10. Apparatus according to claim 9 for sorting on a record card whose perforation is of a predetermined first size as measured in the direction of card motion and whose code hole positions have centers equally spaced apart a predetermined first distance with there being a predetermined second distance between the card leading edge and the center of the nearest code hole position; wherein said first openings have centers equally spaced apart said first distance and each is defined in part by front and

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rear edges as measured in the direction of card motion, said output fluid orifice is of a predetermined second size as measured in the direction of card motion with said control fluid energy being below, or equal to and above, said predetermined threshold value in response to the unblocking of said orifice by an amount equal to and more than, or less than, respectively, a predetermined third distance as measured in the direction of card motion, and wherein said fluid orifice is spaced a predetermined fourth distance from the front edge of that first opening initially reached by a moving record card which lies within a range of values bounded by one terminal value approximately equal to said second distance plus said third distance less one-half said first size less one-half said second size and by another terminal value approximately equal to said second distance plus one-half said first size plus one-half said second size less said third distance.

11. Apparatus according to claim 9 wherein said biasing control fluid means comprises a fluid bypass channel connected between said power stream input channel and said first control stream input channel.

12. Apparatus according to claim 9 wherein said pure fluid amplifier has its said second power stream output channel exhausting to a region adjacent to said one side of the card path such that power stream flow therein prevents a moving record card from inadvertently entering any of said card collecting channels.

13. Apparatus according to claim 9 wherein said variable control fluid energy generating means comprises a control fluid source, a first control fluid channel having one end connected to said control fluid source and the other end connected to said fluid orifice, and a second control fluid channel having one end connected to an intermediate point on said first control fluid channel and its other end connected to said fluid amplifier second control stream input channel.

14. Fluid apparatus for sorting on a record card moving in an initially undeflected direction through a card path, said sorting being performed according to the presence of a perforation which can be punched in any one of a plurality of code hole positions arranged on the card in a column parallel to the direction of card motion between leading and trailing card edges, which comprises:

(a) a plurality of card collecting channels each having a first opening for receiving a record card, and a second opening adapted for connection with card utilization means individual thereto, with all of said first openings being located adjacent to a same one side of the card path and arranged in a column parallel to the direction of card motion;

(b) a pure fluid amplifier having a power stream input channel and power stream source therefore, a fluid interaction chamber, first and second power stream output channels, and first and second control stream input channels for respectively deflecting the power stream into said first or said second power stream output channel, said pure fluid amplifier being connected with its said first power stream output channel exhausting to a region adjacent to the opposite side of the card path such that power stream flow therein deflects at least the leading edge of a moving record card towards said first openings in order that the record card can enter any one of said card collecting channels;

(c) a bypass fluid channel connected between said power stream input channel and said first control stream input channel for applying biasing control fluid to said first control stream input channel of energy such that said fluid amplifier is responsive to control fluid applied to its said second control stream input channel of energy below a predetermined threshold value for causing power stream flow in its said first power stream output channel, and of energy

equal to and above said predetermined threshold value for causing power stream flow in its said second power stream output channel; and

(d) variable control fluid energy generating means comprising the combination of a control fluid source, a first control fluid channel having one end connected to said control fluid source and the other end connected to an output fluid orifice, and a second control fluid channel having one end connected to an intermediate point on said first fluid channel and its other end connected to said second control stream input channel, such that said control fluid energy generating means produces control fluid energy below said predetermined threshold value in response to the substantial unblocking of its said fluid orifice and produces control fluid energy equal to and above said predetermined threshold value in response to the substantial blocking of said fluid orifice, where said fluid orifice is located adjacent the said opposite side of said card path such that it is reached first and is thereafter substantially blocked by a record card until a perforation therein comes into alignment therewith.

15. Apparatus according to claim 14 for sorting on a record card whose perforation is of a predetermined first size as measured in the direction of card motion and whose code hole positions have centers equally spaced apart a predetermined first distance with there being a predetermined second distance between the card leading edge and the center of the nearest code hole position; wherein said first openings have centers equally spaced apart said first distance and each is defined in part by front and rear edges as measured in the direction of card motion, said output fluid orifice is of a predetermined second size as measured in the direction of card motion with said control fluid energy being below, or equal to and above,

said predetermined threshold value in response to the unblocking of said orifice by an amount equal to and more than, or less than, respectively, a predetermined third distance as measured in the direction of card motion, and wherein said fluid orifice is spaced a predetermined fourth distance from the front edge of that first opening initially reached by a moving record card which lies within a range of values bounded by one terminal value approximately equal to said second distance plus said third distance less one-half said first size less one-half said second size, and by another terminal value approximately equal to said second distance plus one-half said first size plus one-half said second size less said third distance.

16. Apparatus according to claim 14 wherein said plurality of first openings lie in a plane making with the plane of said card path a small acute angle whose apex lies in front of that first opening finally reached by an undeflected moving record card.

17. Apparatus according to claim 14 wherein said pure fluid amplifier has its said second power stream output channel exhausting to a region adjacent to said one side of the card path such that power stream flow therein prevents a moving record card from inadvertently entering any of said card collecting channels.

18. Apparatus according to claim 14 wherein said pure fluid amplifier is of the bistable flip-flop type.

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J. N. ERLICH, *Assistant Examiner*.