

Nov. 5, 1957

A. A. CARNINE ET AL

2,812,079

SORTING MACHINE

Filed June 16, 1952

7 Sheets-Sheet 1

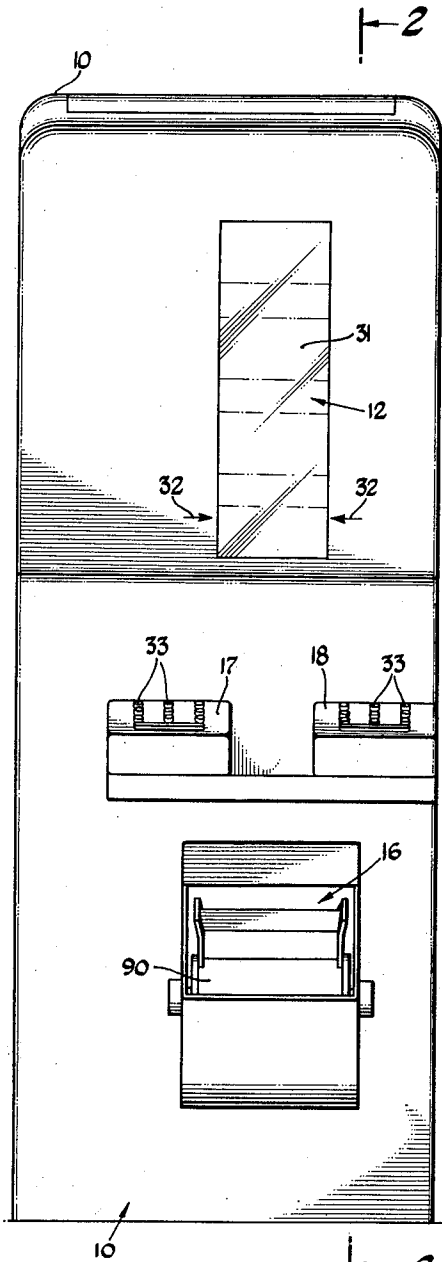


FIG. 1.

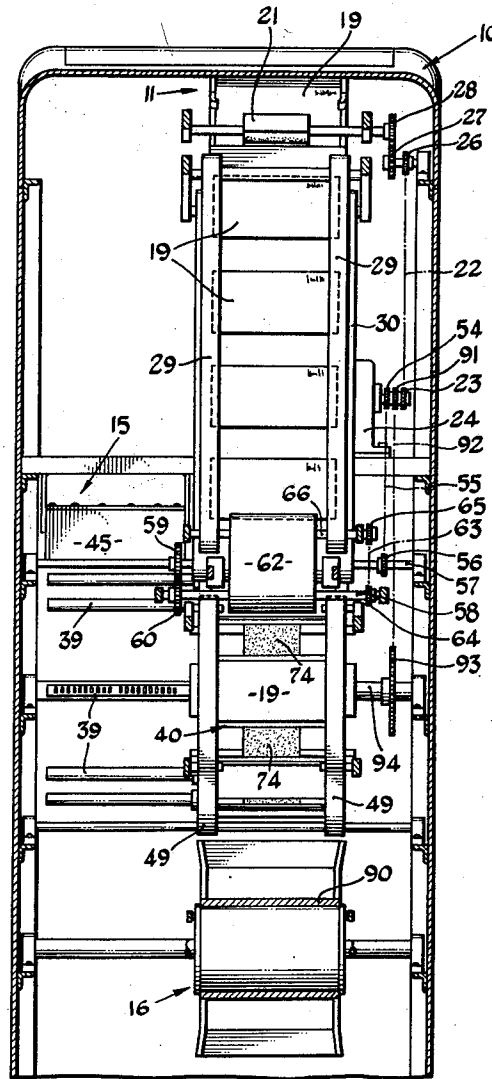


FIG. 3.

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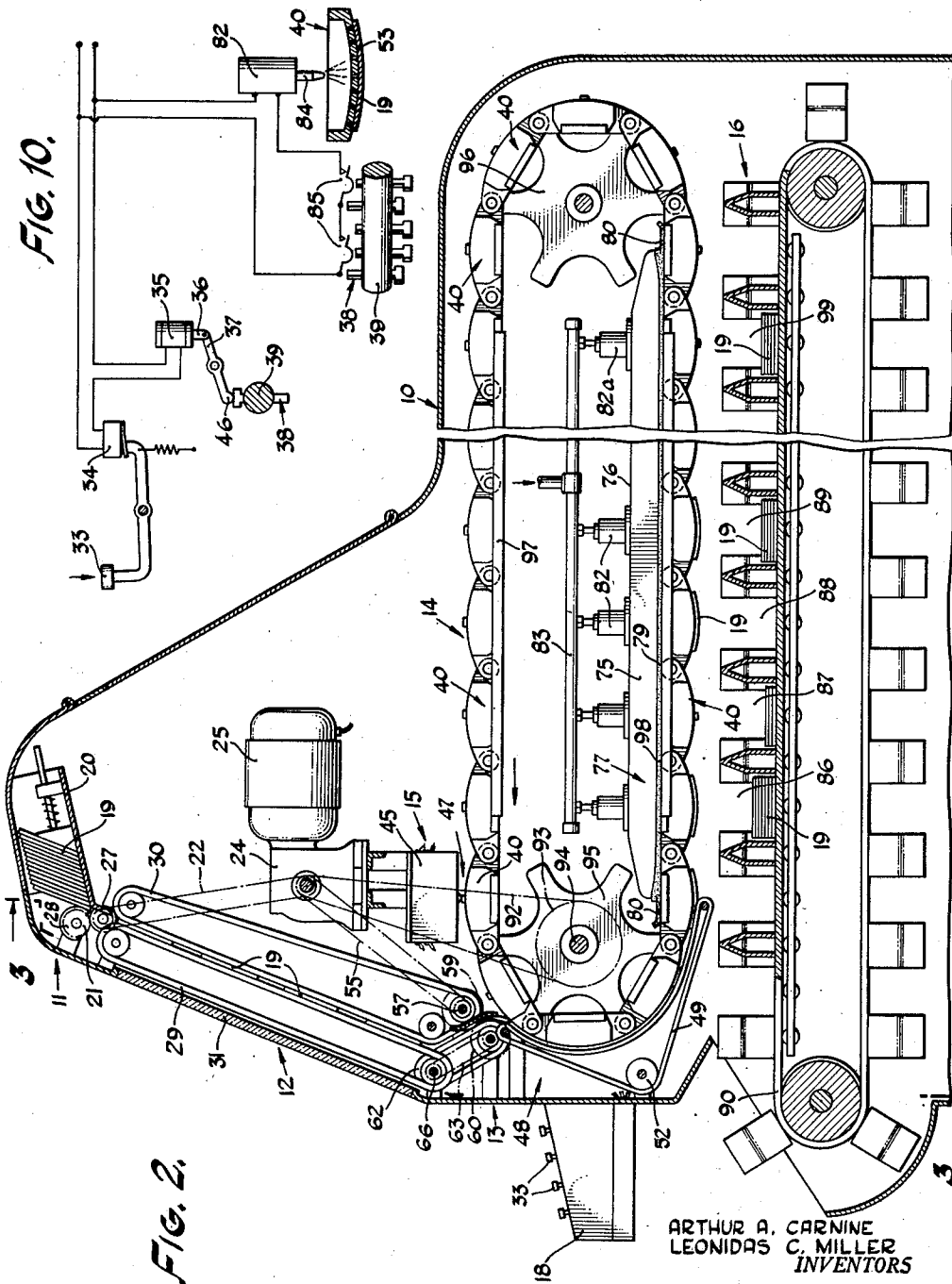
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7 Sheets-Sheet 2



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7 Sheets-Sheet 3

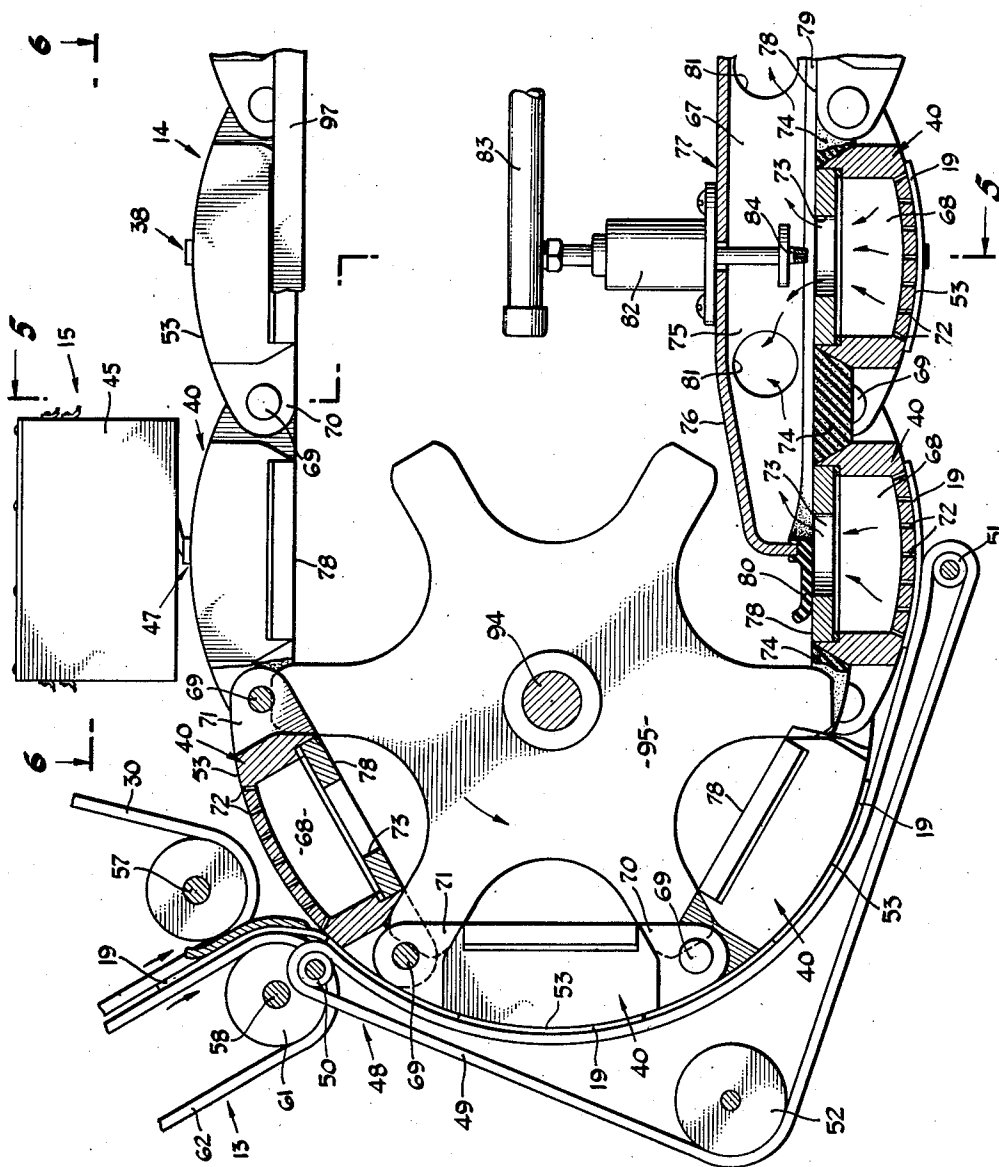


FIG. 4.

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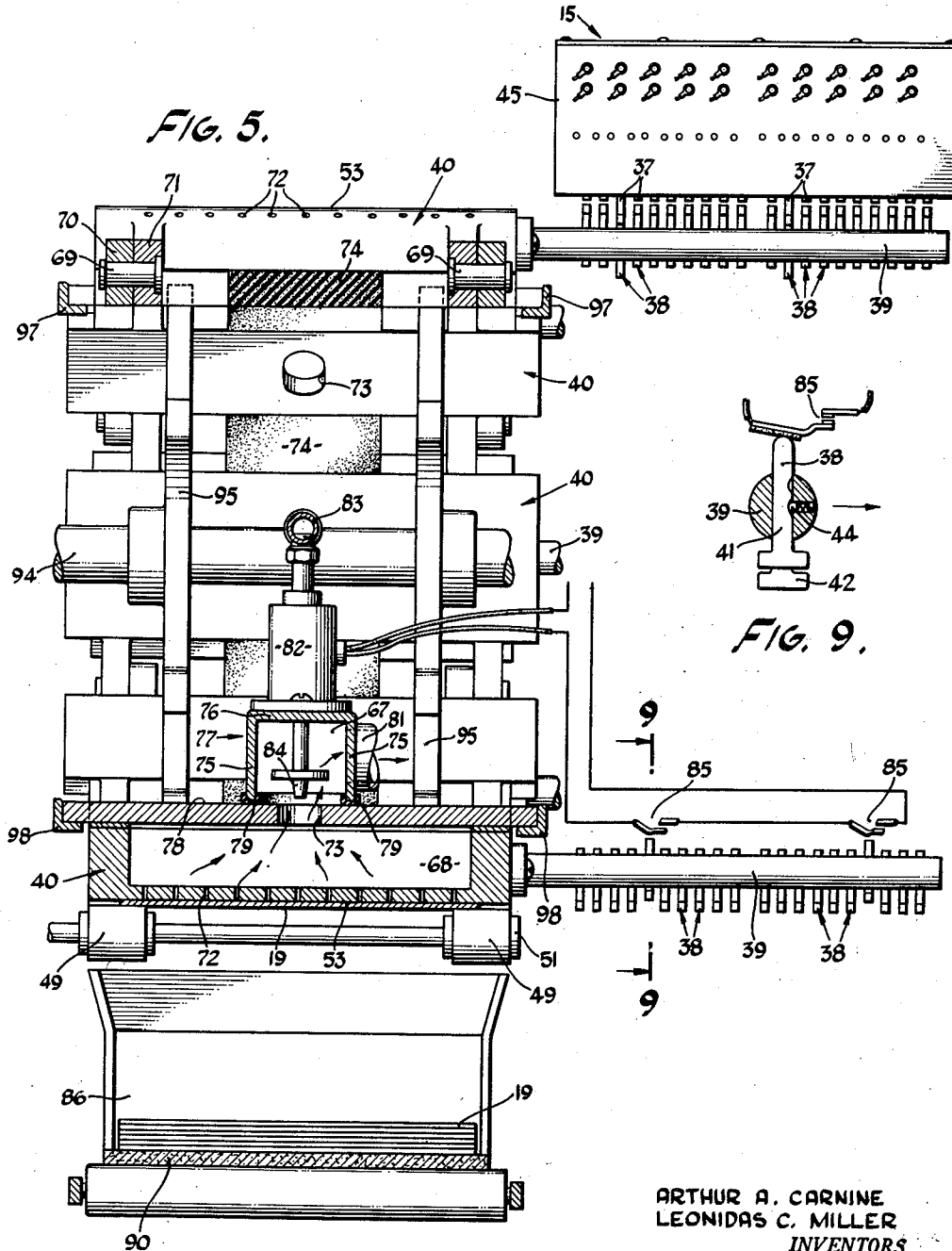
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A. A. CARNINE ET AL
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7 Sheets-Sheet 4



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7 Sheets-Sheet 5

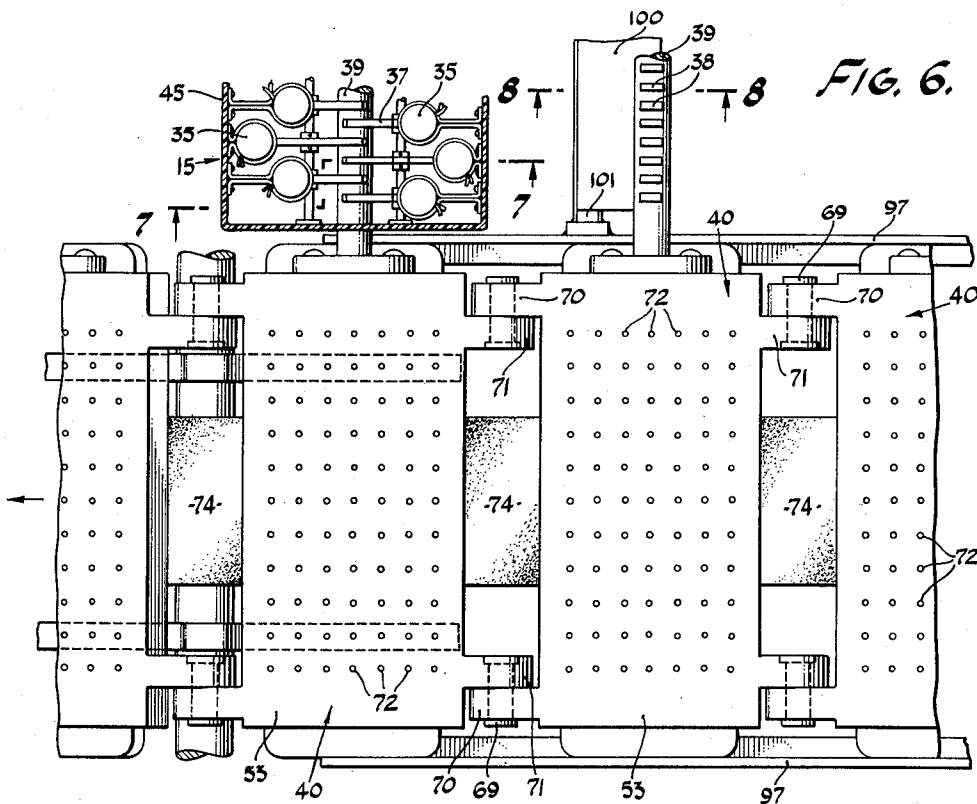


FIG. 6.

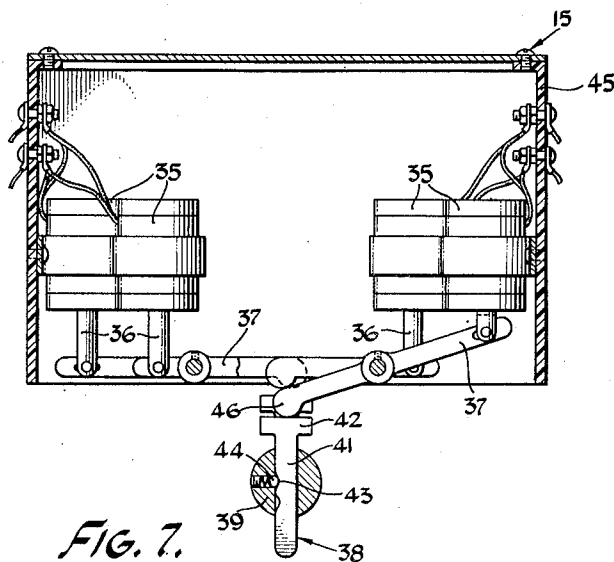


FIG. 7.

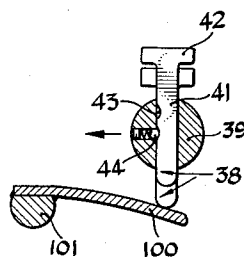


FIG. 8.

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7 Sheets-Sheet 6

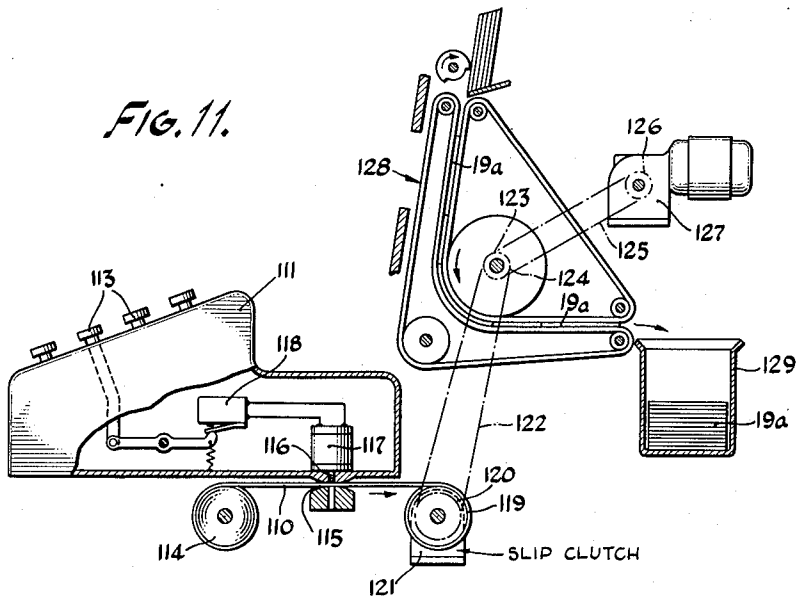
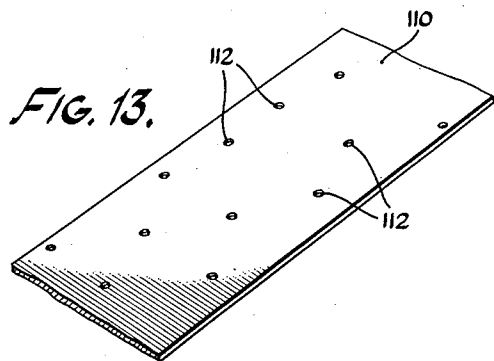
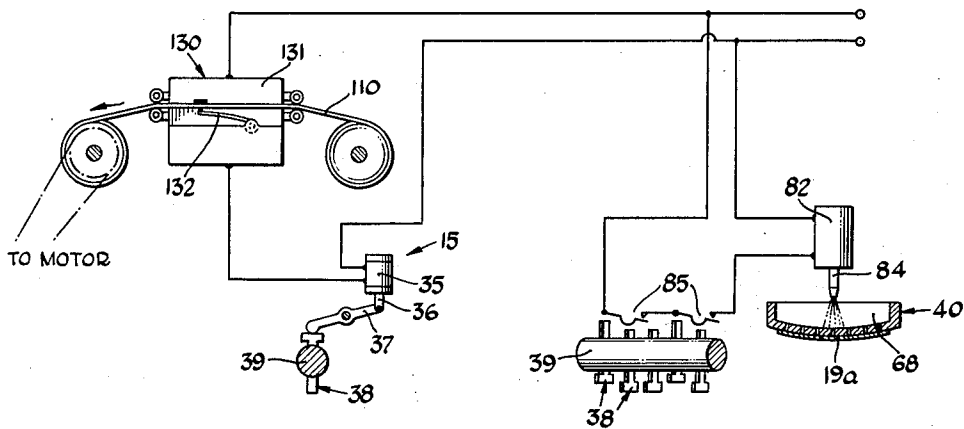


FIG. 12.



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7 Sheets-Sheet 7

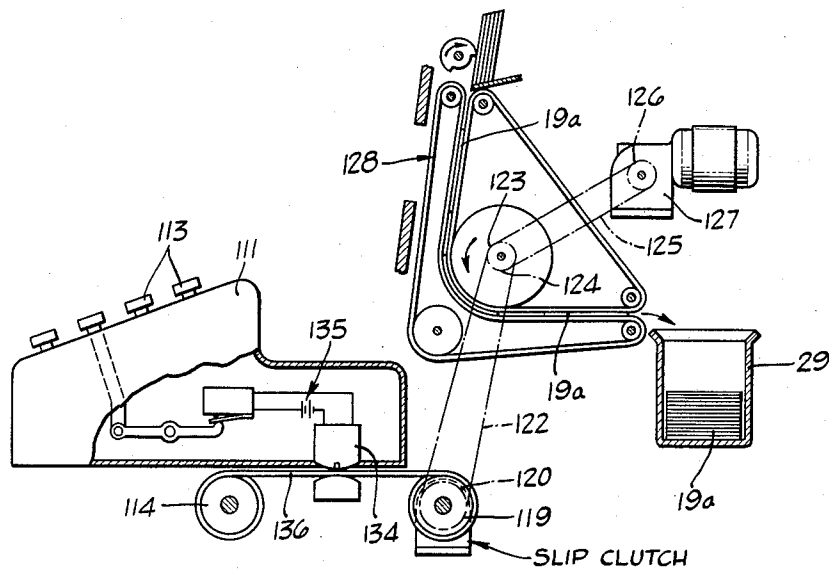


FIG. 11a.

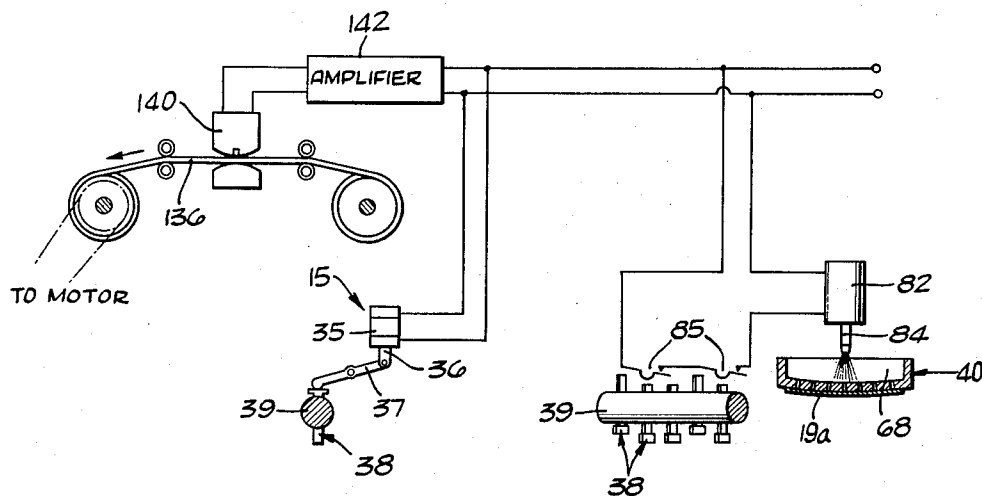


FIG. 12a.

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1

2,812,079

SORTING MACHINE

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Application June 16, 1952, Serial No. 293,822

11 Claims. (Cl. 214—11)

This invention relates to apparatus for sorting sales tickets, freight bills, checks, invoices or other paper slips or cards that are substantially uniform in size and weight. The invention is particularly directed to a machine which will sort such papers or cards at a high rate of speed and deposit the sorted items in any desired numerical or alphabetical sequence.

Large companies engaged in selling to the retail market may have many thousands of accounts and each month carbon copies of sales tickets or credit card purchases or the like must be sorted so that a separate statement can be rendered to each account. Much of the necessary sorting is now done manually at relatively high cost and slow speed. Sorting machines now commercially available have the disadvantages of low capacity, high initial cost and lack of flexibility.

It is the principal object of our invention to provide an improved sorting machine which overcomes the disadvantages enumerated and which is capable of a very high sorting rate while requiring the attention of only a single operator.

Another object is to provide a sorting machine having an endless conveyer provided with a series of conveyer elements, together with intelligence-carrying means on each conveyer element which is operable to effect release of an item carried by said element adjacent one of a series of sorting compartments spaced along the direction of travel of the conveyer.

Another object is to provide improved means enabling an operator to place the necessary intelligence on each of the conveyer elements in sequence.

Another object is to provide a sorting machine employing a moving tape which controls the sorting operations as the items to be sorted are fed seriatim into the machine.

Another object is to provide improved means enabling the operator to place the necessary intelligence on the tape for controlling sorting operations in the machine.

Another object is to provide an improved conveyer device for carrying each of the items for sorting from a common inlet position to one of a large number of discharge positions, under control of the tape.

Another object is to provide a sorting device of novel type having vacuum operated means for separately conveying each of the items to be sorted.

Another object is to provide improved means whereby the intelligence-carrying tape may control the operation of the sorting conveyer device.

Another object is to provide a sorting apparatus in which the operator transfers intelligence in sequence from each of the items to be sorted to a tape member, and in which the tape member and items to be sorted may then be transferred to a conveyer-like sorting machine, so that the sorting operation may be carried out automatically under control of the tape without attention from the operator.

2

Other and more detailed objects and advantages will appear hereinafter.

In the general plan of operation, the items to be sorted pass seriatim before the operator so that the operator can see an identifying number or letter printed on each item. The items pass by the operator's viewing screen at a speed limited only by the operator's ability to read the identifying letters or numbers on the items. The operator has a keyboard, preferably with ten keys for each hand. Such a keyboard will operate a machine having one hundred separate compartments or receiving pockets.

The keyboard is connected electrically to transfer intelligence directly to a conveyer sorting device, or alternately to a tape member which is in turn used to control operation of a conveyer type sorting device. When the keyboard is connected to transfer the intelligence directly to the sorting conveyer, each of the conveyer elements is provided with switch operating mechanism, which mechanism is set by actuation of the keys as each conveyer element passes a particular station. The conveyer element then picks up its corresponding item for sorting and carries it along the path of the conveyer over a series of stationary sorting compartments. When the switch operating mechanism reaches the proper electric switch, the conveyer element is caused to discharge its particular item for sorting into the correct sorting compartment. Subsequently the switch operating mechanism is returned to neutral position for re-setting.

When the keyboard is connected to transfer intelligence to a moving tape, actuation of a key or combination of keys causes a hole to be punched in a moving tape, or an electrical impulse to be transmitted to a moving magnetic tape, or other intelligence to be transmitted to the moving tape member. The position of the hole or the type of electrical impulse or other intelligence transmitted to the tape corresponds to the particular combination of keys punched by the operator. After passing the viewing screen, the items to be sorted are picked up in sequence and carried along by the sorting conveyer which passes over a series of stationary sorting compartments. The speed of the moving tape is synchronized with respect to the rate of feed of the items to be sorted and the rate of travel of the conveyer. The tape travels along until the particular intelligence thereon actuates one of a series of electrical switches. The switch closes an electrical circuit which is effective to deposit the particular corresponding item in the proper sorting compartment.

The tape may be employed to control the operation of the sorting conveyer during the time interval while the operator transfers intelligence to the tape or, if desired, the items to be sorted and the tape corresponding thereto may be placed in the sorting machine at a time subsequent to the transferring of intelligence to the tape. By this means, an operator can prepare a control tape for a particular group of items to be sorted, and the tape and group of items later mounted in the sorting conveyer for carrying out the actual sorting operation.

In the drawings:

Figure 1 is a front elevation showing a sorting machine embodying our invention;

Figure 2 is a side elevation, partly in section, taken substantially on the lines 2—2 as shown in Figure 1;

Figure 3 is a sectional elevation taken substantially on the lines 3—3 as shown in Figure 2;

Figure 4 is a sectional view on an enlarged scale showing details of construction of the forward end of the sorting conveyer;

Figure 5 is a sectional elevation taken substantially on the lines 5—5 as shown in Figure 4;

Figure 6 is a plan view, partly in section, taken substantially on the lines 6—6 as shown in Figure 4;

Figure 7 is a detailed sectional elevation taken substantially on the lines 7—7 as shown in Figure 6;

Figure 8 is a sectional detail taken substantially on the lines 8—8 as shown in Figure 6;

Figure 9 is a sectional detail taken substantially on the lines 9—9 as shown in Figure 5;

Figure 10 is a diagrammatic view and wiring diagram showing the principle of operation of the device illustrated in Figures 1—9;

Figure 11 is a diagrammatic view, partly in section, showing a modified form of device employing a control tape;

Figure 11a is a diagrammatic view partly in section showing an arrangement for the structure shown in Figure 11 employing a magnetic control tape.

Figure 12a is a diagrammatic view and wiring diagram showing an arrangement for controlling operation of the sorting conveyor from information recorded on the magnetic tape.

Figure 12 is a diagrammatic view and wiring diagram showing use of the tape for controlling operation of the sorting conveyor; and

Figure 13 is a perspective view of one form of the control tape.

Referring to the drawings, the housing generally designated 10 provides an enclosure for the sheet feeding mechanism 11, the viewing conveyer 12, the sheet transfer device 13, the sorting conveyer 14, the trigger setting mechanism 15 and the sorting compartments 16. The keyboards 17 and 18 project from the forward end of the housing 10 for easy accessibility. The sheets, cards or other items 19 to be sorted are mounted in a hopper 20 and fed in sequence through a conventional feed roller 21. The roller 21 is driven under power from chain 22 extending from the drive sprocket 23 on the output shaft of the gear transmission 24. An electric motor 25 supplies power from the transmission 24. The chain 22 drives sprocket 26, which in turn drives gears 27 and 28 and thereby turns the feed roller 21.

The sheets 19 are thus fed serially between the belts 29 and 30 of the viewing conveyer mechanism 12. The sheets 19 pass in sequence below the transparent panel 31 so that the operator can see identifying numbers or letters printed on each sheet 19.

The power sprocket 54 drives chain 55 and sprocket 56 on shaft 57. This shaft 57 drives the lower belt 30. The shaft 57 also drives shaft 58 through gears 59 and 60. The pulley 61 fixed on shaft 58 drives the transfer belt 62. A chain 63 connecting sprockets 64 and 65 drives the shaft 66 and this shaft in turn drives the belts 29. As the particular number or letter passes the index marks 32 mounted on the housing 10 (see Figure 1), the operator depresses the key or keys 33 on the keyboards 17 and 18 corresponding to the number or letter on the particular sheet 19 then passing the index marks 32.

As shown diagrammatically in Figure 10, depressing one or more of the keys 33 serves to actuate an electric switch 34 and thereby close an electric circuit through a corresponding solenoid 35. The passage of electric current through the solenoid 35 causes the armature 36 thereof to be retracted and thereby causes the pivoted lever 37 to depress a switch operating tab or trigger 38 with respect to its carrier bar 39.

One of these carrier bars 39 is fixed to each link 40 in the sorting conveyer 14, and projects laterally therefrom. Each carrier bar 39 is provided with a series of triggers 38 spaced along the length thereof and mounted in parallel relation. As shown in Figures 7, 8 and 9, each trigger 38 has a stem 41 provided with a head. Detents 43 are provided in the stem 41 for engagement by a spring urged ball 44. By means of this arrangement, each of

the triggers 38 is frictionally held in one of two positions. As shown in Figure 6, 7 and 8, a solenoid 35 and pivoted lever 37 are provided for each of the triggers 38. The levers 37 are of two different lengths in order to enable the large number of solenoids 35 to be mounted within a case 45 having minimum overall dimensions. In the particular arrangement illustrated, each keyboard 17 and 18 has ten keys 33. Each key 33 operates its own particular solenoid 35 and its own particular trigger 38.

The operator depresses certain of the keys 33 when the indicia on the sheet 19 is approximately in alignment with the index marks 32. At this instance one of the carrier bars 39 is approaching a position directly below the operating ends 46 of the pivoted levers 37. If the carrier bar 39 is directly below the operating ends 46 when the keys 33 are punched by the operator, the head ends 42 of certain of the triggers 38 are contacted by the pivoted levers 37 and depressed relative to the carrier bar 39. If the carrier bar is approaching a position below the operating ends 46 of the pivoted levers 37 at the time the keys 33 are punched, certain of the levers 37 are swung to operating position when the rounded ends 46 engage certain of the heads 42 on the triggers 38 as the carrier bar 39 moves under the rounded ends 46 on the levers 37.

The link 40, together with its carrier bar 39, moves forwardly and the position of the triggers 38 is now fixed for subsequent actuation of electric switches, as described below. The length of the path of travel of the link 40 from the trigger setting station, generally designated 47, to the sheet pick up position, generally designated 48, is the same as the length of travel of the sheet 19 from its position adjacent the index marks 32 to the pick up position 48. Thus, the sheet 19 is picked up by the particular link 40 having its switch triggers 38 set in a position corresponding to the number or letter printed on that particular sheet 19.

The sheet 19 passes from between the belts 29 and 30 of the viewing conveyer 12 under the transfer belt 49. This transfer belt 49 passes around the small end rollers 50 and 51 and around the central larger roller 52. The belt 49 receives its motion from frictional contact with the outer curved surfaces 53 of the links 40 and is not separately powered.

Means are provided for securing each of the sheets 19 to its particular link 40. As shown in the drawings, this means includes a suction chamber 67 which acts to apply suction to the recess 68 in each of the duplicate links 40. The links 40 are connected by pins 69 which pass through ears 70 and 71. The curved face 53 of each link 40 is provided with a series of small apertures 72, which communicate with the recess 68. An opening 73 in the back side of each link 40 communicates with the chamber 67. Resilient seal elements 74 are mounted between adjacent links 40 and these seal elements are sufficiently wide to span the distance between the parallel side plates 75 of the chamber 67. The cover plate 76 is integrally joined with the side plates 75 to form an inverted channel member, generally designated as 77. This channel member cooperates with the flat surfaces 78 on the links 40 and with the resilient seal elements 74 to define the chamber 67. Slipper rails 79 (see Figures 4 and 5) may be provided on the lower edges of the side plates 75 for contacting the links 40 and the resilient seal elements 74. An upturned shoe 80 at the forward ends of the slipper rails 79 engages each of the links 40 in sequence. The belt 49 holds the sheets 19 in engagement with the curved faces 53 on the links 40 until suction pressure is applied to the recess 68 from the suction chamber 67. The application of suction pressure to the recess 68 lowers the pressure in each of the apertures 72, with the result that each sheet 19 is held to its respective link 40 by means of suction pressure.

At intervals along the length of the chamber 67 are provided lateral pipes 81 which are connected to a header, not shown, leading to a power driven suction pump, not

5

shown, or other source of suction pressure. The pressure within the chamber 67 is only slightly below atmospheric pressure but this is sufficient to cause each of the sheets 19 to adhere tightly to the curved surface 53 on each of the conveyer links 40.

Means are provided at intervals along the length of the inverted channel 77 to effect disengagement of each sheet 19 with respect to its carrying link 40. As shown in the drawings, this means includes a series of solenoid operated valves 82 which are each connected to a pressure supply pipe 83 and which are provided with downward directed discharge nozzles 84. The position of the nozzle 84 and the size of the opening 73 is so chosen that a short blast of air under pressure through the nozzle 84 is sufficient to increase the pressure within the recess 68 directly therebelow so that the sheet 19 is quickly and effectively separated from the curved face 53. The volume of air admitted through each nozzle 84 for separating the sheet 19 is insufficient to cause any appreciable change of the pressure within the relatively large vacuum chamber 67.

A pair of electric switches 85 is associated with each of the solenoid valves 82 and is mounted on a stationary part of the machine. Each pair of electric switches has its own distinctive spacing and each is contacted by only one of the triggers 38. As shown in Figure 5, the switches 85 and solenoid valve 82 are connected in series so that both switches 85 must be closed in order to energize the solenoid valve 82 and admit a blast of compressed air through the nozzle 84. From this description, it will be understood that any particular solenoid valve 82 is actuated only when the particular combination of triggers 38 on one of the bars 39 is such as to actuate both of the switches 85. In the device shown in the drawings, there are two groups of triggers 38 on each of the bars 39 and only one trigger is displaced on each group. Consequently one hundred different combinations are provided and hence it is possible to have one hundred solenoid valves 82 and associated nozzles 84 spaced along the length of the inverted channel 77.

Under each of the solenoid valves 82 is positioned a sorting compartment 86, 87, 88, 89, et seq. These sorting compartments may comprise stationary bins or, as shown in Figure 2 of the drawings, may be mounted on a conveyor belt 90 so that after the sorting operation is complete the sorted piles can be brought to the forward end of the machine in groups and removed by the operator. During the sorting operation, the conveyor belt 90 remains at rest.

The motor 25 supplies power through the transmission 24 to drive the sorting conveyer 14 via sprocket 91, chain 92, sprocket 93 and shaft 94. The sprocket 95 at the forward end of the machine is driven by the shaft 94 and this sprocket engages the links 40 of the conveyer 14 in the manner shown clearly in Figure 4. The idler sprocket 96 engages the links 40 in the other end of the machine. Guide rails 97 may be provided for minimizing sag of the upper flight of the conveyer 14 and similarly guide rails 98 are provided to support the links 40 against sagging movement away from contact with the slipper rails 79 on the inverted channel 77.

At one of the sorting compartments 99, and preferably the one most remote from the forward end of the machine, the corresponding solenoid valve 82^a is caused to open whenever one of the bars 39 passes beneath it and regardless of the setting of the various trigger elements 33. By this means, any sheet 19 which has remained on its carrying link and traveled past all of the regular sorting compartments will be discharged into the catchall compartment 99. A particular sheet 19 might fail to fall into its proper compartment if the operator had failed to operate the keyboards while that particular sheet was passing the index marks 32. The solenoid valve 82^a, which acts successively on each link 40, insures that all

6

of the sheets 19 shall be separated from the carrying links 40 before the links reach the idler sprocket 96.

Means are provided to reset each of the triggers 38 to a neutral position before the triggers approach the station 47. As shown in Figures 6 and 8 of the drawings, this means may comprise a stationary curved plate 100 carried on a support 101 attached to the housing. The plate 100 is shaped so that as the triggers 38 pass thereover each of the depressed triggers is returned to its elevated position.

The operation of the machine will be clear from the foregoing description. The sheets 19 are stacked in the hopper 20 and proceed in sequence through the viewing conveyer 12, the transfer conveyer 13 and are each picked up by one of the links at the station 48. Each sheet 19 is held against its respective carrying link 40 by means of the belts 49 until the links are contacted by the forward end of the suction chamber 67. From this point, each sheet 19 is secured to its respective carrying link by suction pressure. It is released over the proper sorting compartment 86, 87, 88, 89, et seq. when the triggers 38 on its particular carrying link 40 close both switches 85 for one of the solenoid valves 82. A short blast of compressed air into the recess 68 in the link quickly removes the sheet 19 from the link and deposits it in the correct sorting compartment. After the entire group of sheets has been sorted, the machine is stopped by interrupting the power supply to the motor 25. The conveyor belt 90 may then be operated in an obvious manner to bring each sorting compartment to the front of the machine so that the sorted sheets 19 may be removed by the operator.

In the modified form of our invention shown in Figures 11-13, a tape 110 receives intelligence from the keyboard 111. The tape 110 may take any convenient or desirable form and, as shown in the drawings, comprises a strip of paper into which holes 112 may be punched. The location of the holes depends upon which of the keys 113 are actuated by the operator. The tape 110 may be mounted in a supply coil 114 and pass through the throat 115. A series of punches 116, operated by solenoids 117, are adapted to punch the holes 112 in the paper tape. The actuation of any particular key 113 closes a switch 118 to energize a particular solenoid 117. The tape 110 is wound on a take-up spool 119 by means of a sprocket 120 driving through a slip clutch 121. The sprocket receives its power from chain 122, sprocket 123, sprocket 124, chain 125, sprocket 126 and power transmission 127. The operator observes the number or letter on each of the sheets 19^a as they pass through the viewing conveyer 123 and punches a corresponding key 113. The sheets 19^a are then stacked in the same order in the receptacle 129. The sequence of hole spacings in the tape then corresponds to the numbers or letters on the sheets 19^a in the receptacle 129.

The punched tape 110 may then be employed to control the operation of sorting the sheets 19^a in the sorting conveyer 14. In this form of our invention the tape operated switch mechanism 130 is used in conjunction with the trigger setting mechanism 15, previously described. The punched tape 110 is caused to pass through a switch contact box 131 having a plurality of spring mounted contact fingers 132 positioned therein. Whenever a pair of holes 112 in the tape pass over the ends of these fingers, a pair of contacts close to complete an electrical circuit through one of the solenoids 35, thereby swinging one of the levers 37 to depress a trigger 38 relative to its carrier bar 39. In this case, the tape 110 controls the trigger setting solenoids 35 instead of operating them directly from the keyboards 17 and 18. The operation of the sorting conveyer 14 is substantially the same as described above. The triggers 38 actuate switches 85 for energizing solenoid valves 82. These draw air under pressure through nozzles 84 to overcome the vac-

uum pressure within the recess 68 in the carrier link 40 and thereby release the sheet 19^a.

While we have shown and described a paper tape 110 having holes 112 punched therein for controlling the trigger setting mechanism 15, it will be understood that a magnetic tape instead of a punch tape could be employed if desired. In such a case, the switches 118 would each cause a distinctive signal to be passed to the magnetizing element of a magnetic tape device and thereby impress a characteristic magnetic pattern on the tape. The separated patterns along the magnetic tape would then be used in a magnetic pick up device to energize the solenoids 35 in the trigger setting mechanism 15.

Figure 11a shows structure substantially identical with that shown in Figure 11, except that magnetic tape is being used to receive information from the keys 113 on the keyboard. A plurality of adjacent recording heads 134 (only one of which is shown) are positioned over a magnetic tape which passes under them. Each head may be said to write in a track, which is the area of tape passing under that head. There is only one head associated with each key. When a key is depressed, the lever attached thereto will close a switch 133. The switch will cause current to flow from a potential source 135 through the associated one of the magnetic recording heads 134 to record a magnetic pulse in the track on the magnetic tape 136. It will be understood that the magnetic heads 134 correspond to the hole-punching mechanism 117 in Figure 11. Thus, for each key which is depressed there will be a different switch 133 which is connected to a different head 134, thereby a magnetic pulse pattern is recorded on the tape representative of the keys which are depressed. Further operation of the apparatus is identical with that described for Figure 11, and thus further description is not necessary.

Figure 12a is substantially identical with Figure 12, except that magnetic tape is employed in place of the punched paper tape. The magnetic tape 136 is advanced as previously described past the magnetic tape reading station, which includes several magnetic sensing heads 140. Whenever the presence of a pulse is sensed by one of these magnetic sensing heads, the output is applied to an associated one of many amplifiers 142, which provides an output in response having sufficient current to energize the solenoid 15 and the solenoid 82 if the switches 85 are closed. It will be recognized that the pulse pattern on the magnetic tape serves in an analogous manner to the hole pattern on the paper tape shown in Figure 13.

Having fully described our invention, it is to be understood that we do not wish to be limited to the details herein set forth but our invention is of the full scope of the appended claims.

We claim:

1. In a device for sorting paper sheets or the like according to indicia thereon, the combination of: an endless conveyor having a plurality of duplicate link elements, pneumatic means for securing each of the sheets in sequence to one of said link elements, a plurality of pneumatic discharge means spaced along the length of the conveyor at stationary locations for separating each sheet from its respective link element, and means including movable parts on each link element for actuating said discharge means.

2. In a device for sorting paper sheets or the like according to indicia thereon, the combination of: an endless conveyor having a plurality of duplicate link elements, means for feeding the sheets in sequence to said conveyor, suction means for securing each of the sheets in sequence to one of said link elements, a plurality of fluid pressure injecting means spaced along the length of the conveyor at stationary locations for separating each sheet from its respective link element, and means on each link element for actuating said fluid pressure injecting means.

3. In a device for sorting paper sheets or the like ac-

cording to indicia thereon, the combination of: an endless conveyor having a plurality of duplicate link elements, a plurality of triggers movably supported on each of said link elements, suction means for securing each of the sheets in sequence to one of said link elements, a plurality of fluid pressure discharge means spaced along the length of the conveyor for separating a sheet from its respective link element, and means whereby each of said discharge means may be actuated by certain of said triggers.

4. In a device for sorting paper sheets or the like according to indicia thereon, the combination of: an endless conveyor having a plurality of duplicate link elements, a plurality of triggers movably supported on each of said link elements, means for selectively moving certain of said triggers during operation of the conveyor, means for feeding the sheets in sequence to said conveyor, suction means for securing each of the sheets in sequence to one of said link elements, a plurality of fluid pressure injecting means spaced along the length of the conveyor at stationary locations for separating a sheet from its respective link element, and means whereby each of said fluid pressure injecting means may be actuated by certain of said triggers.

5. In a device for sorting paper sheets or the like according to indicia thereon, the combination of: an endless conveyor having a plurality of duplicate link elements, switch operating triggers movably supported on each of said link elements, means for selectively actuating certain of said triggers during movement of the conveyor, means for feeding the sheets in sequence to said conveyor, suction means for securing each of the sheets in sequence to one of said link elements, a plurality of fluid pressure discharge means spaced along the length of the conveyor at stationary locations for separating a sheet from its respective link element, a series of sorting compartments positioned along the path of travel of said conveyor, at least one electric switch associated with each of said compartments and adapted to be actuated by certain of said triggers, and means whereby each of said discharge means may be actuated by electric circuits closed by certain of said electric switches.

6. In a device for sorting paper sheets or the like according to indicia thereon, the combination of: an endless conveyor having a plurality of duplicate link elements, switch operating triggers movably supported on each of said link elements, means for selectively actuating certain of said switch operating means during movement of the conveyor, suction means for securing each of the sheets in sequence to one of said link elements, a plurality of fluid pressure injection means spaced along the length of the conveyor for separating a sheet from its respective link element, a series of sorting compartments positioned along the path of travel of said conveyor, at least one electric switch associated with each of said compartments and adapted to be actuated by certain of said triggers, and means whereby each of said fluid pressure injection means may be actuated by electric circuits closed by certain of said electric switches.

7. In a device for sorting paper sheets or the like according to indicia thereon, the combination of: an endless conveyor having a plurality of duplicate link elements, switch operating means movably supported on each of said link elements, means for selectively actuating certain of said switch operating means during movement of the conveyor, means for feeding the sheets in sequence to said conveyor, suction means for securing each of the sheets in sequence to one of said link elements, a plurality of fluid pressure injection means spaced along the length of the conveyor for separating a sheet from its respective link element, a series of sorting compartments positioned along the path of travel of said conveyor, at least one electric switch associated with each of said compartments and adapted to be actuated by the switch operating means, and means whereby each of said fluid pres-

sure injection means may be actuated by electric circuits closed by certain of said electric switches.

8. In a sorting conveyer, the combination of: a plurality of duplicate links pivotally connected to form an endless band, power means for moving the links in a predetermined path, each of the links having a face provided with a plurality of apertures, each link having a recess therein communicating with said apertures, resilient sealing means interposed between adjacent links, means for subjecting each of the link recesses to suction pressure, a plurality of valves spaced along the length of said conveyer, means supplying air under pressure to each of said valves, a nozzle on each valve for directing air pressure into said link recesses, and means operated by movement of the links for opening each of said valves.

9. In a sorting conveyer, the combination of: a plurality of duplicate links pivotally connected to form an endless band, power means for moving the links in a predetermined path, each of the links having a face provided with a plurality of apertures, each link having a recess therein communicating with said apertures, resilient sealing means interposed between adjacent links, means for subjecting each of the link recesses to suction pressure, said means comprising an inverted channel member having side portions thereon in sliding contact with said links and said sealing means, means for subjecting the interior of said inverted channel member to suction pressure, a plurality of valves spaced along the length of said channel member, means supplying air under pressure to each of said valves, a nozzle on each valve for directing air pressure into said link recesses, and means operated by movement of the links for opening each of said valves.

10. In a sorting conveyer, the combination of: upper and lower flights passing around sprockets at the ends thereof, each of the flights having a plurality of duplicate links pivotally connected end to end, each of the links having a convexly curved working face on one side and a substantially flat sealing face on the opposite side, the

radius of the curve of each link being so related to the effective radius of at least one of said sprockets that the said working faces of the links rounding said sprocket lie substantially on a single cylindrical surface having its axis coincident with the sprocket axis, and seal means slidably engaging the flat faces of a plurality of links in one of said flights.

11. In a sorting conveyer, the combination of: upper and lower flights passing around sprockets at the ends thereof, each of the flights having a plurality of duplicate links pivotally connected end to end, each of the links having a convexly curved working face and a flat sealing face, the radius of the curve of each link being so related to the effective radius of at least one of said sprockets that the said working faces of the links rounding said sprocket lie substantially on a single cylindrical surface having its axis coincident with the sprocket axis, each of the links having a recess therein and a plurality of apertures in the working face communicating with said recess, and a suction pressure applying member having portions slidably engaging the flat sealing faces on the links in one of said flights.

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