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PERFORATED CARD SORTING MACHINE

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5 Claims. (Cl. 209—110)

This invention relates to perforated-card sorting machines and more particularly to a sorting machine for sorting cards on which data are contained in the form of combinations of holes

5 In a copending application of E. A. Ford, Serial No. 748,347 for Sorting machines, filed November 7, 1924, there is disclosed a machine adapted to sort record cards wherein one perforation in a column is provided to represent a digit, the position of the hole determining its value. In such a system ten positions are necessary in order to represent the ten digits. In the present system I employ but four positions to a column to represent the ten digits, using one or a combination of two perforations to represent the several digits. Additional characters or information may be represented by employing combinations of holes in which three holes are used. According to the aforesaid application, the cards are fed one at a time under a sensing brush which is set to cooperate with a particular column on the card. As each index point on a card passes under the sensing brush, the leading edge of the card passes under a corresponding guide chute. If a particular index point in the column has been perforated, when such point passes under the sensing brush the brush reaches through the hole and contacts with an electric plate or roll beneath the card, thus closing a circuit through an electromagnet and thus in turn releases the guide blades or chute blades. Those of the blades under which the card has already passed will be held in upper position by the card while those under which the card has not yet passed will drop. The card as it continues to travel will then pass between the last of the raised blades and the first of the lowered blades and will be conducted between these guide blades into a particular sorting pocket. The pocket into which the card is deposited corresponds with the index point position in the column, which is perforated.

In the present invention I have disclosed a machine having guide or chute blades similar to those disclosed in the Ford application. While the Ford machine uses one sensing brush I may employ either one, two or four such brushes. Where four brushes are employed the cards are fed in the usual manner and when the four index positions register with the four brushes simultaneously current is momentarily supplied to the brushes or their corresponding contact strips. If any of the brushes are then in register with perforations they will close circuits through the perforations and energize corresponding electro-

magnets. There are four such magnets each of which controls the closing of a set of electric contacts. After the contacts have been closed in accordance with the perforations in the column on a card, an analyzing device proceeds to analyze the condition of the several contacts synchronously with the continued feeding of the card. When the analyzing device senses a closed circuit through one or a combination of several of the sets of contacts, a sorting electromagnet is energized and this releases the chute blades permitting those under which the moving card has not yet passed to drop while those under which the card has already moved are held up by the blades. The card then continues between the chute blades and is deposited in a pocket corresponding to the value represented by the perforation or combination of perforations in the column which has been sensed.

Where two analyzing brushes are employed, current is supplied to the brushes at about the time the first and second index point positions reach the first and second of the analyzing brushes respectively. If either of the brushes then registers with a perforation, a circuit will be closed through a corresponding electromagnet controlling the closing of the electric contacts as before. The circuit through the brushes is then opened and just before the third and fourth index point positions register with the first and second brushes respectively, current is again supplied to the brushes and if either of the brushes then registers with a perforation in the card, a circuit is closed through the perforation energizing a corresponding one of a second set of two magnets again controlling the closing of a set of contacts. The circuit is again interrupted through the brushes and as the card continues to feed and to pass into the entering ends of the chute blades, the analyzing device proceeds to analyze the condition of the contacts synchronously with the movement of the card as before.

Referring to the drawings:

Fig. 1 shows a front elevation of a sorting machine;

Fig. 2 is a sectional detail of the card feeding and analyzing end of the machine;

Fig. 3 is a sectional detail of the sensing brushes and the receiving ends of the guide or chute blades;

Fig. 4 is a development of a rotating commutator adapted to analyze the condition of sorting contacts;

Fig. 5 is a wiring diagram illustrating the operation of the machine;

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Fig 6 shows the arrangement of perforations in any column to represent the various numerical values,

Fig 7 illustrates a form of the invention in which two perforation sensing brushes may be used,

Fig 8 illustrates an arrangement using one brush;

Fig 9 shows the use of one brush with a commutator arrangement for bringing the several magnets into successive control of the brush

In Fig 1 the machine is shown as comprising a supporting base 1 and a plurality of receiving pockets 2. A supply or magazine pocket is shown at 3. An electric motor 4 is connected by a belt 5 to a pulley 6 fixed on the main operating shaft 7 of the machine. This shaft runs the full length of the machine and drives all of the feed rollers 8 as well as the shaft 9 for controlling the card picker. The details of the driving connections are not shown here as they form no part of the present invention and may be readily obtained by reference to the aforesaid application, if desired, although it is obvious that one skilled in the art may readily supply such connections. In Fig 2 the cards 10 are shown as stacked in the supply magazine, the card picker 11 is mounted on a frame 12 having a pin and slot connection at 13 with an arm 14 pivoted at 15 and connected by a link 16 to an eccentric point 17 on a disk 18 carried by the shaft 9. The picker 11 will thus be caused to move toward the left and then back toward the right to normal position once each cycle of operation of the machine. Each time the picker moves to the left it will carry with it the lowermost card of the stack of cards 10 causing such card to be fed through a micrometer throat 19. The card is then gripped by the feed rollers 8 and is carried by the successive sets of rollers the full length of the machine toward the left or until it is guided by the chute blades into one of the intermediate receiving pockets 2. Before reaching the chute blades 20 the card passes under the several sensing brushes 21 (see also Fig 3). The several brushes 21 are mounted in a common carrier 22 which is adjustable along a shaft 23 to cooperate with any of the several columns on a card. Corresponding with each brush is a contact strip 24, the strips being adapted to cooperate with the brushes in any of their several positions with respect to the columns on the card. The ends 20' of the chute blades normally rest on the upper surface of a supporting plate 25 which is normally held in its upper position by a latching member 26 cooperating with a projection 27 on the plate, the latch being held in latching position by a spring 28. The latch 26 may be pivoted at 29, the lower end thereof constituting the armature of an electromagnet 30. When magnet 30 is energized, rocking the armature or latch 26, the plate 25 will be released and the downward pressure of the blades 20 will depress the plate 25. As shown in Fig 3 the card 10 has passed under the ends of several of the chute blades before the plate 25 was released thus upon the releasing of the plate these blades are held in their upper position by the card while those of the blades which have not yet been reached by the card have moved downwardly. As the card continues to move it will then pass under the last of the raised blades and over the first of the depressed blades and will be carried to the corresponding pocket.

After the card has passed beyond the ends of all of the blades, the plate 25 may be raised to

normal position ready for the next cycle of operation of the machine. The restoring mechanism is shown as comprising a lever 31 pivotally mounted at 32 and connected at 33 to the plate 25. A cam 34 carried by shaft 35 which may be connected for operation to the main drive shaft 7 is adapted to engage the lower end of lever 31 to rock the latter counterclockwise, restoring the plate 25. After the cam 34 has engaged and actuated lever 31 but before releasing the same, a second cam 36 is adapted to engage an arm 37 to positively restore the latch member 26 to latching position. The arm 37 is pivotally mounted at 38 and is positioned at its lower end between flanges 39 on a spring-pressed member 40 having at one end a flange 41 cooperating with the lower end of the latch or armature 26 to actuate the latter. Normally the spring 28 will serve to move the latch to latching position. The connection through lever 37 to the driving shaft of the machine is merely a precaution to insure positive restoration of the latch.

An analyzing commutator 42 (Fig 1) may be carried by a shaft 43 which may also be driven by the drive shaft 7. Referring to the wiring diagram in Fig 5, restoring cams 44 may also be mounted on the shaft 43 or otherwise mounted for operation in synchronism with the rotation of the commutator drum 42. Several sets of electric contacts *a*, *b*, *c* and *d* are normally held in open position by latches 45 which constitute the armatures of electromagnets 46, 47, 48 and 49. Springs 50 serve to maintain the armatures 45 in cooperation with the contacts to hold them in open position after the restoring cams 44 have actuated them to such position. Each of the magnets 46, 47, 48 and 49 is connected to a corresponding one of the contact strips 24. In Fig 5 the operating motor 4 is shown diagrammatically and may be started by depression of the start key 51. This in turn energizes the holding magnets 52 and 53. As the cards commence to feed they will actuate the card lever 54 closing contacts 55 after which the starting key 51 may be released. Current will then flow from the left side of the line 56 through contacts 55, contacts 52' now closed, magnet 52 and magnet 53, to the right side of the line 57. Current will also pass from the left side of the line through motor 4, contacts 58 now closed to the right side of the line. Should cards cease to feed, card lever 54 will return to normal position permitting the opening of contacts 55 thus breaking the circuit through magnet 53 permitting contacts 58 to open thus causing stoppage of motor 4 to stop the operation of the machine.

Presuming the machine to be in operation and cards to be feeding one at a time under the several brushes 21, just before the first index point position on the card reaches the brush 21a the counterclockwise rotation of the commutator 42 will cause a contact segment 59 to cooperate with a brush 60. The segment 59 is integral with the commutator ring 61 which is in constant cooperation with a brush 62. Thus as the four index point positions on the card pass under the four reading or sensing brushes, current is in effect supplied to the brushes. Should there be a perforation in any of the index point positions, a circuit will thus be closed from the left side of the line 56 through wire 63, brush 62, commutator ring 61, segment 59, brush 60, wire 64, the corresponding one of magnets 46, 47, 48 and 49, contact strip 24, brush 21 and back to the right

side of the line 57. As the commutator 42 continues to rotate the circuit will be broken between segment 59 and brush 60 before the brush 21 rides out of the perforation in the card. Thus the breaking of the circuit will not take place at the perforation reading brushes. A perforation through one or more of the positions on the card thus causes energization of one or more of the magnets 46-49. This in turn will attract the corresponding one or ones of armature latches 45 releasing one or more of the contacts *a-d* permitting the latter to close. As the card 10 now continues to be fed through the machine and the drum 42 continues to rotate, the card will pass above the plate 25 and beneath the ends 20' of the chute blades 20 as shown in Fig 3. Before the card has passed under the first of the chute blades the first row of segments 65 will cooperate with the several analyzing brushes 66 (see also Fig 4). The first of these rows of segments in the present instance is adapted to represent the value 12. This value as shown in Fig 6 is represented by three perforations in the second, third and fourth positions counting down. This combination of perforations will have caused closure of the contacts *a, b* and *c*. Thus when the several brushes 66 cooperate with the segments 65 the circuit will be closed from the left side of the line through wire 63, brush 62, to commutator ring 61 then through the connection 67 to the first one of the segments 65 then to the corresponding brush 66 through wire 68 to the contacts *a* back through wire 68' through the next brush 66 to the next segment 65 through connection 69 to the next segment 65 then through the next set of brushes and contacts *b* back to segments 65 and contacts *c* and from the last of the segments 65 to the commutator ring 70 through brush 71, wire 72, contacts 73 normally closed, magnet 30 and back to the right side of the line. The energization of magnet 30 then actuates the latch 26 releasing the plate 25 and permitting the chute blades to press the plate 25 downwardly so that as the card continues to be fed it will pass above the depressed chute blades and be guided into the 12 pocket. If perforations representing the value 12 do not exist in the column on the card being analyzed, then as the first row of segments 65 passes under the brushes 66 no circuit will be closed through the magnet 30 and the card will continue to feed passing under the end of the first chute blade. The second row of segments 65 will then pass under the analyzing brushes 66 and if a combination of perforations representing the value 11 or X has caused the closure of the corresponding contacts *a-d* a circuit will be closed at this time through the magnet 30 to control the dropping of the chute blades. Similarly as the leading edge of the card passes under the successive ends 20' of the chute blades a row of contacts will pass into cooperation with the analyzer brushes 66 until a circuit is found through the contacts *a-d* at which time the magnet 30 will be energized to control the disposition of the card which has just been sensed. In the illustration in Fig 3 a condition is represented wherein a card having a perforation in the last of the four positions is being fed. A hole in this position according to Fig 6 represents the numeral 6. Thus, when the four positions are under the sensing brushes the contacts *d* are closed. Then as the card proceeds to feed, after it has entered beneath the end of the fifth chute blade, the row of segments 65 representing the numeral 6 cooperate with the brushes 66 and a circuit is closed through magnet 30. Latch 26 then releases plate 25 and all the blades not supported by the card are permitted to drop as shown so that the card will pass into the "6" path and will be guided into the "6" pocket. When the magnet 30 is energized and the plate 25 drops, the latter is adapted to cause opening of contacts 73 so that thereafter during the continued rotation of commutator 42 for the remainder of the cycle of operation no further closing of circuits will take place through the contacts *a-d* and magnet 30. While this opening of the circuit is not essential to the successful operation of the machine, it serves to prevent unnecessary making and breaking of circuits through the commutator and brushes and thus prolongs the life of the elements. After the commutator has rotated so that the last of the rows of segments 65 has passed under the brushes 66 and the card has passed beyond the ends of the chute blades, the restoring cams 34, 36 may be actuated to restore the ends of the chute blades 20 to their normal positions. Also the cams 44 will open any of the contacts *a-d* that may have been closed and the armature latches 45 will latch such contacts in open position.

In Fig 7 I have shown how the invention may be carried out with the use of two card sensing brushes 21'. In this instance only two contact strips 24' are employed. One of the strips 24' is connected to two of the magnets 46' and 48' while the other strip is connected to the other two magnets 47' and 49'. The magnets 48' and 49' are in turn connected through contacts 75, 76 to the left side of the line. Cams 77, 78 may be mounted on the commutator shaft 43 or otherwise connected to operate in synchronism therewith. The cams are so timed that when the first two index point positions on the card are about to register with the two brushes or in other words after the first position has passed the right hand brush 21' as viewed in Fig 7, the circuit will be closed through contacts 75, 76 and is broken before the brushes ride out of the perforations in the card. Thus cam 78 gradually closes contacts 75 while cam 77 holds contacts 76 open. Then just before the first position on the card reaches the left hand brush 21', cam 77 releases contact 76 permitting the latter to close. Now if a perforation appears in either of the two positions passing under the card, a circuit will be closed from the left side of the line 56' through contacts 76, contacts 75, through one or both of magnets 48' and 49', through the corresponding one or both of contact strips 24', through one or both of the brushes 21' back to the other side of the line 57'. The magnets 48' and 49' will serve to control contacts *a, b* as in Fig 5. Before the index point positions pass out of register with the sensing brushes 21', cam 78 will release the contacts 75 permitting them to break quickly. As the card continues to feed and the third position on the card passes under the right hand brush 21' but before it reaches the left hand brush, a cam 77' also driven in synchronism with the drum 42, releases contacts 76' permitting them to close so that when the third and fourth positions on the card register with the brushes 21, current may pass from the left side of the line through contacts 76', 75' through either or both of magnets 46', 47', strips 24', brushes 21' and back to the right side of the line. Before the brushes ride out of the perforations, the cam 78' permits contacts 75' to open quickly breaking the circuit through the brushes. Contacts *c* and *d* of Fig 5 will then be controlled according to the

condition of the third and fourth positions on the card. Now as the card continues to be fed through the machine and passes under the ends 20' of the blades 20, the commutator 42 will be rotating in synchronism therewith to control the dropping of the chute blades as previously described, to control the disposition of the card.

The invention may also be carried out with the use of but one card reading brush 21'' as shown in Fig 8. In this instance, the four magnets 46, 47, 48 and 49 are all connected to the one contact strip 24' and are separately connected to groups of make and break contacts 46a, 47a, 48a and 49a similar to the make and break contacts 75, 76 and 75', 76' of Fig 7. With this arrangement closure is effected through contacts 46a when the first position on the card is passing under the brush 21'' so that if a perforation appears in this position, magnet 49 will be energized. Similarly closure will be effected through contacts 47a when the second position on the card is passing under the brush 21'' to energize magnet 48, if a perforation appears in this position. The same is true in connection with contacts 48a and 49a for energizing magnets 47 and 46, if perforations appear in the third and fourth positions. As shown in Fig 9, instead of using the sets of contacts 46a—49a for operatively connecting the magnets successively with the left side of the line, I may employ segment contacts 59a, 59b, 59c, 59d in connection with the drum 42 of Fig 5. These segments perform the same function for the magnets separately as is performed by the segment 59 in Fig 5 for all of the magnets simultaneously. In other words, in Fig 9, when the first position on the card is passing under the brush, the commutator brush 60a will be passing over segment 59a thus closing a circuit from the left side of the line through brush 62, ring 61, segment 59a brush 60a, magnet 46, contact strip 24a, card reading brush 21' and back to the right side of the line. When the second position is passing under the card the circuit will be from the left side of the line through brush 62, ring 61, brush 60b, magnet 47, contact 24'', brush 21'' and back to the other side of the line, etc.

I claim

1 In a perforated record sorting machine, means for feeding records having a plurality of perforation positions in a column, a pair of electric circuit contacts representing each contact position in a column, means for simultaneously sensing a plurality of such positions on a record while the record is in motion and adapted to cause

closure of one or more of said pairs of contacts, a rotatable drum and a pair of brushes representing each of said first named pairs of contacts and adapted to cooperate therewith to control the disposition of the card.

2 In a perforated record controlled sorting machine, means for feeding records having a plurality of perforation positions, means for analyzing said positions for perforations while the record is in motion, a pair of electric circuit contacts for each position being sensed, a commutator drum having combinations of interconnected segments and means cooperating with said contacts and said drum for controlling the distribution of the record.

3 In a perforated card controlled sorting machine, means for feeding cards, means for sensing perforations in a card being fed, electric contacts controlled by said sensing means, commutator brushes connected to said contacts, a commutator having variously interconnected segments for cooperating with said brushes, means for operating said commutator synchronously with said feeding means and card distributing means controlled through said drum and contacts for controlling the disposition of the cards.

4 In a sorting machine provided with sorting stations, the combination with means for concurrently analyzing the combinational designations of cards and directly setting up devices in accordance with such designations, of a plurality of superimposed sorting blades for sorting cards to the sorting stations, a timer for reading out said devices and operated in synchronous relationship with the feeding of the card as said card cooperates with the progressive lengths of the card receiving ends of the blades, and means operated by the timer and acting in conjunction with the card to select a passage between adjacent blades.

5 In a card sorting machine, a set of card distributing devices comprising a plurality of superimposed sorting blades, analyzing devices for concurrently reading combinational designations of a moving card, electrical contacts directly set under control of the analyzing devices, means for reading out said contacts as said card cooperates with the progressive lengths of the blades of the card distributing devices, and means operated by the reading means and acting in conjunction with the card to select a passage between adjacent blades.

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PERFORATED CARD SORTING MACHINE

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5 Sheets-Sheet 1

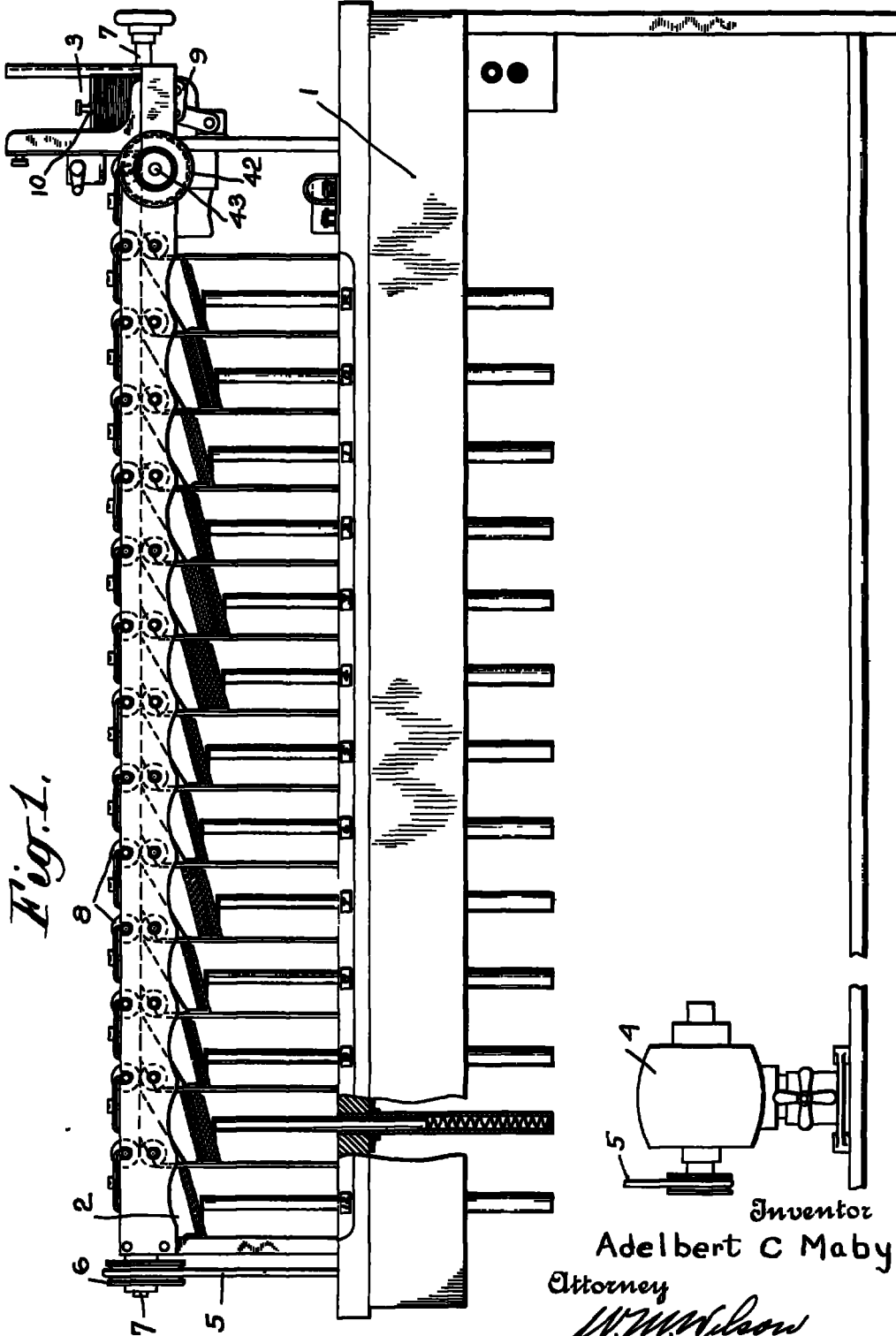


Fig. 1.

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5 Sheets-Sheet 2

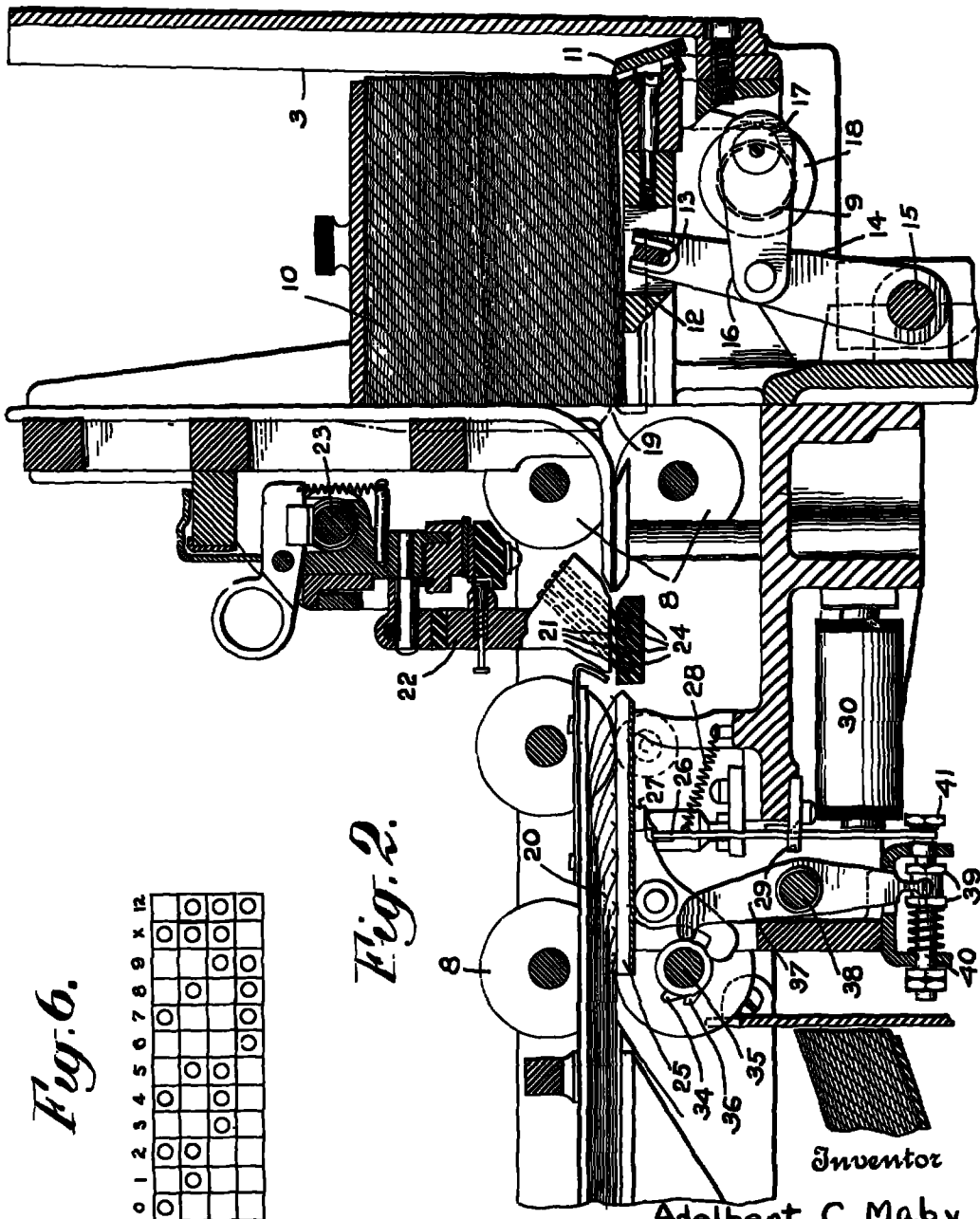


Fig. 6.

Fig. 2.

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5 Sheets-Sheet 3

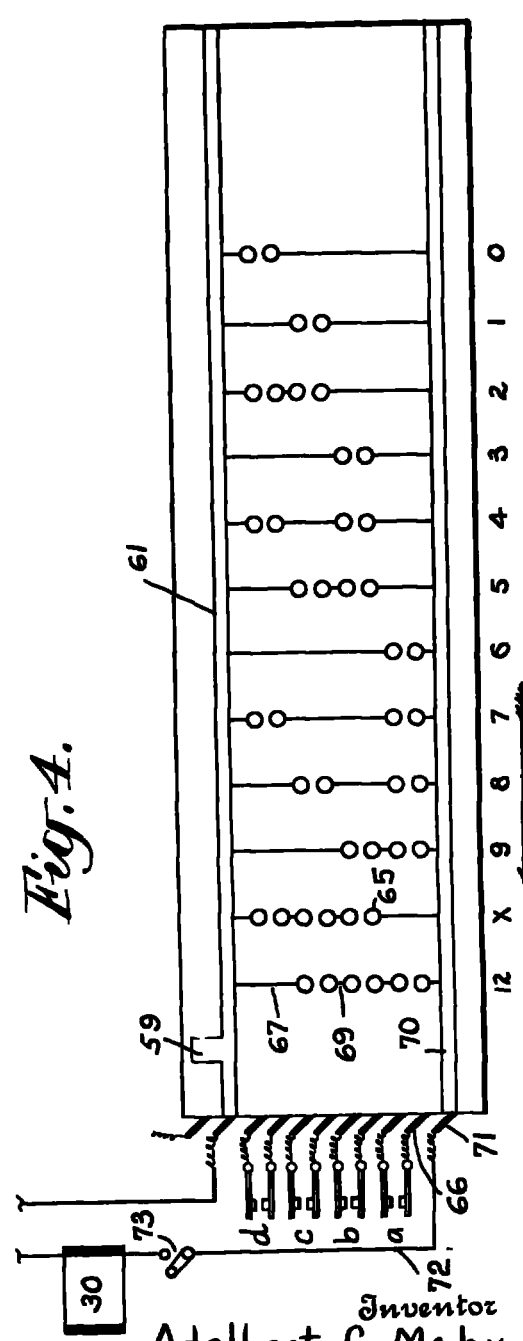
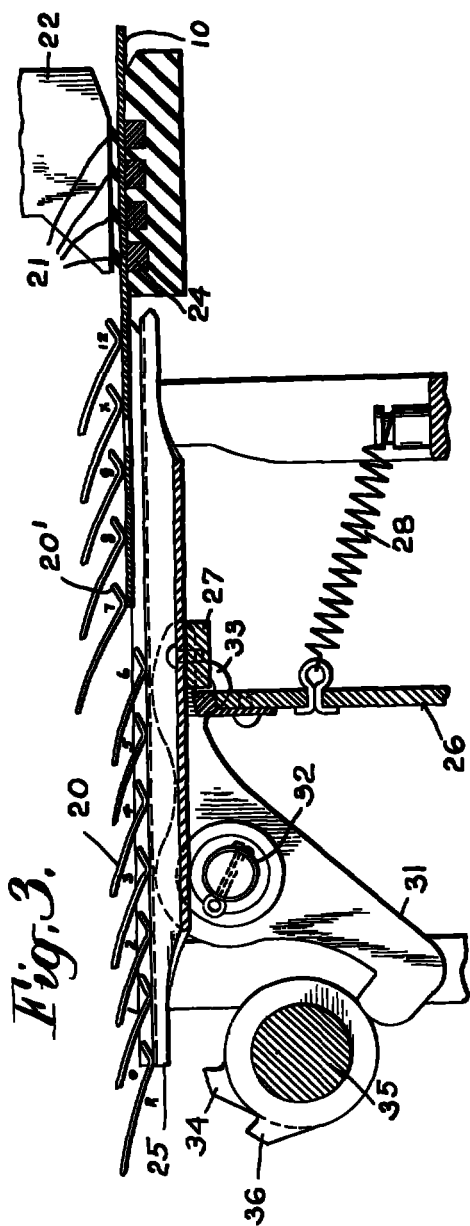


Fig. 4.

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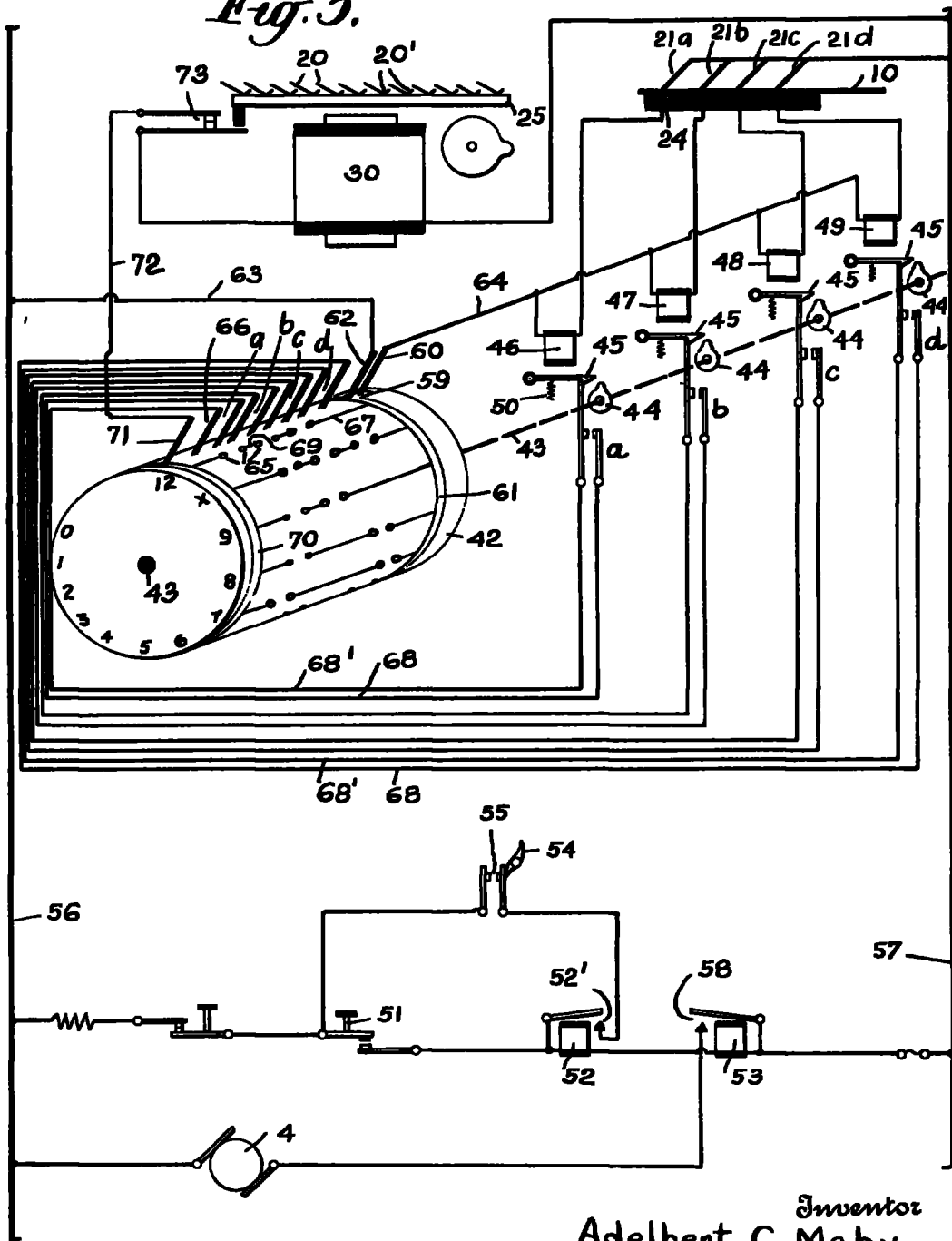
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Fig. 5.



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Fig. 7.

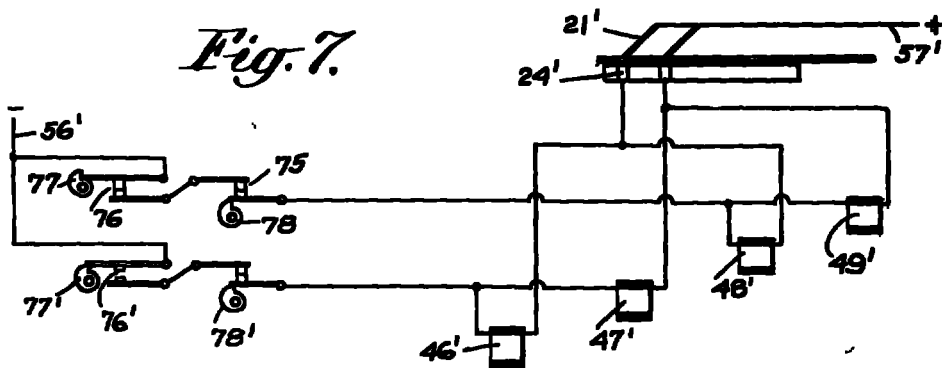


Fig. 8.

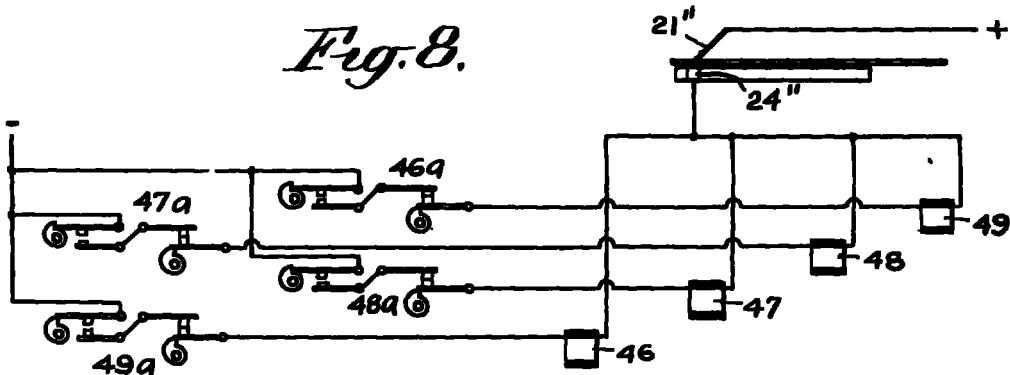
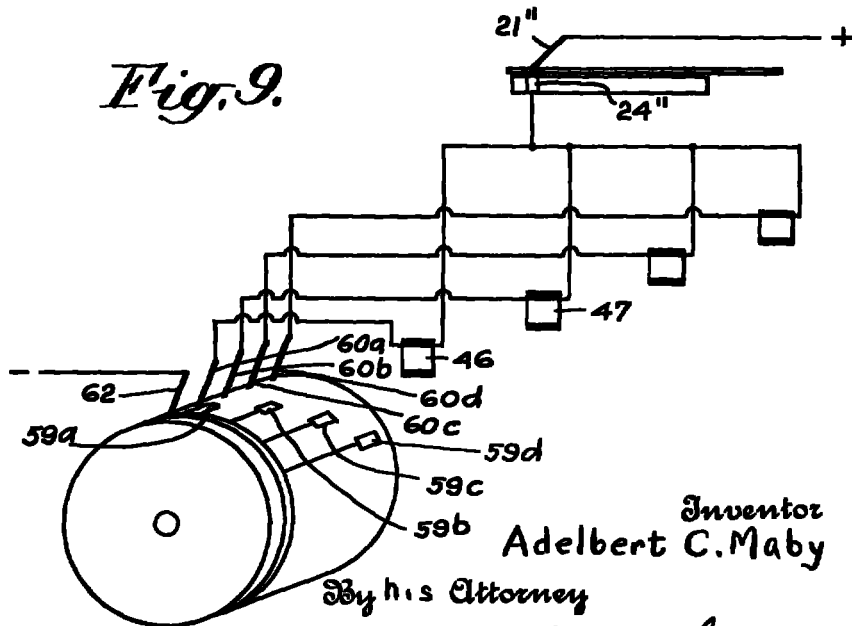


Fig. 9.



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