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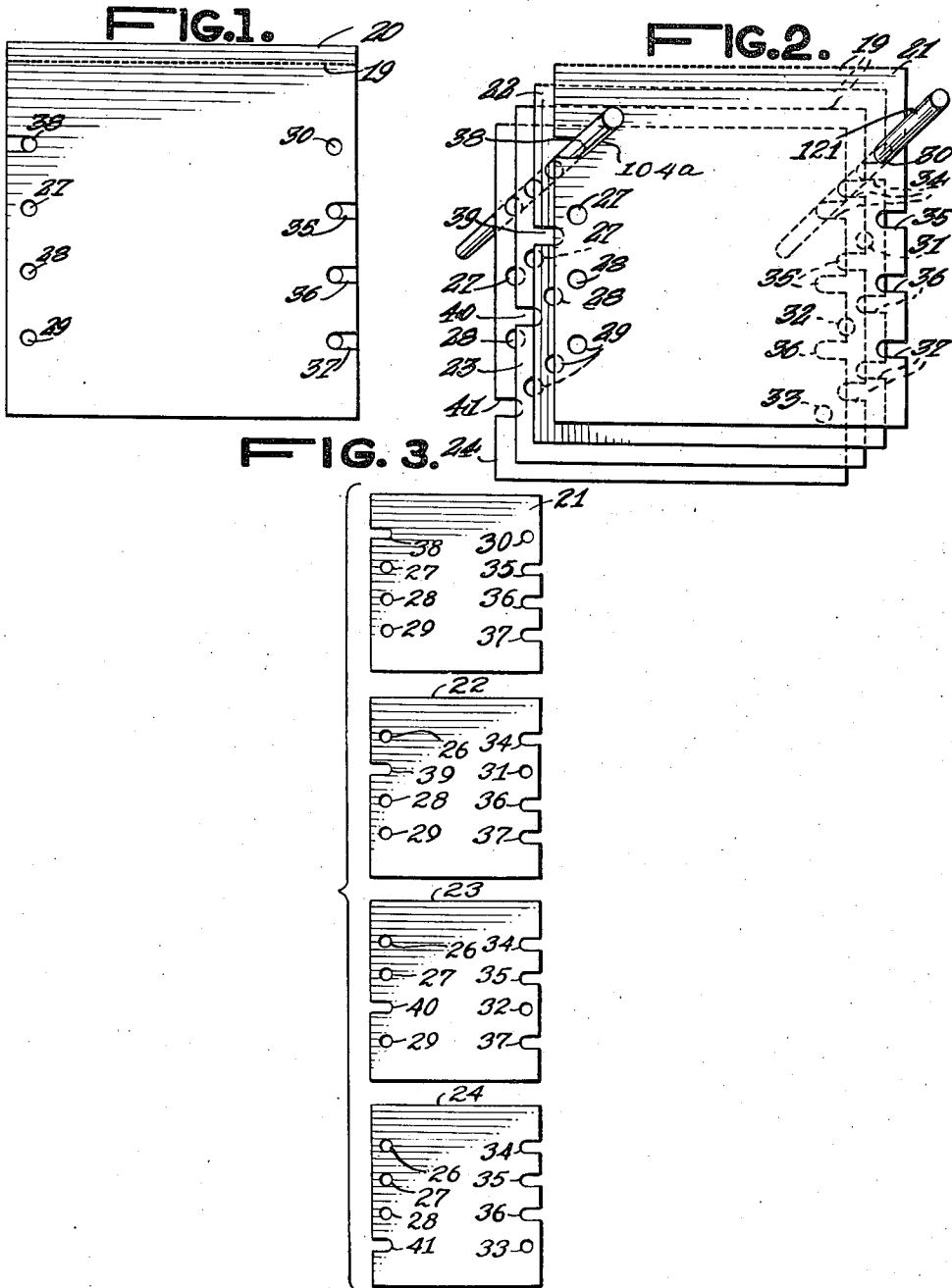
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2,359,705

MACHINE FOR SORTING AND SEPARATING SHEETS OR PRINTED FORMS

Original Filed May 31, 1941

4 Sheets-Sheet 1



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Oct. 3, 1944.

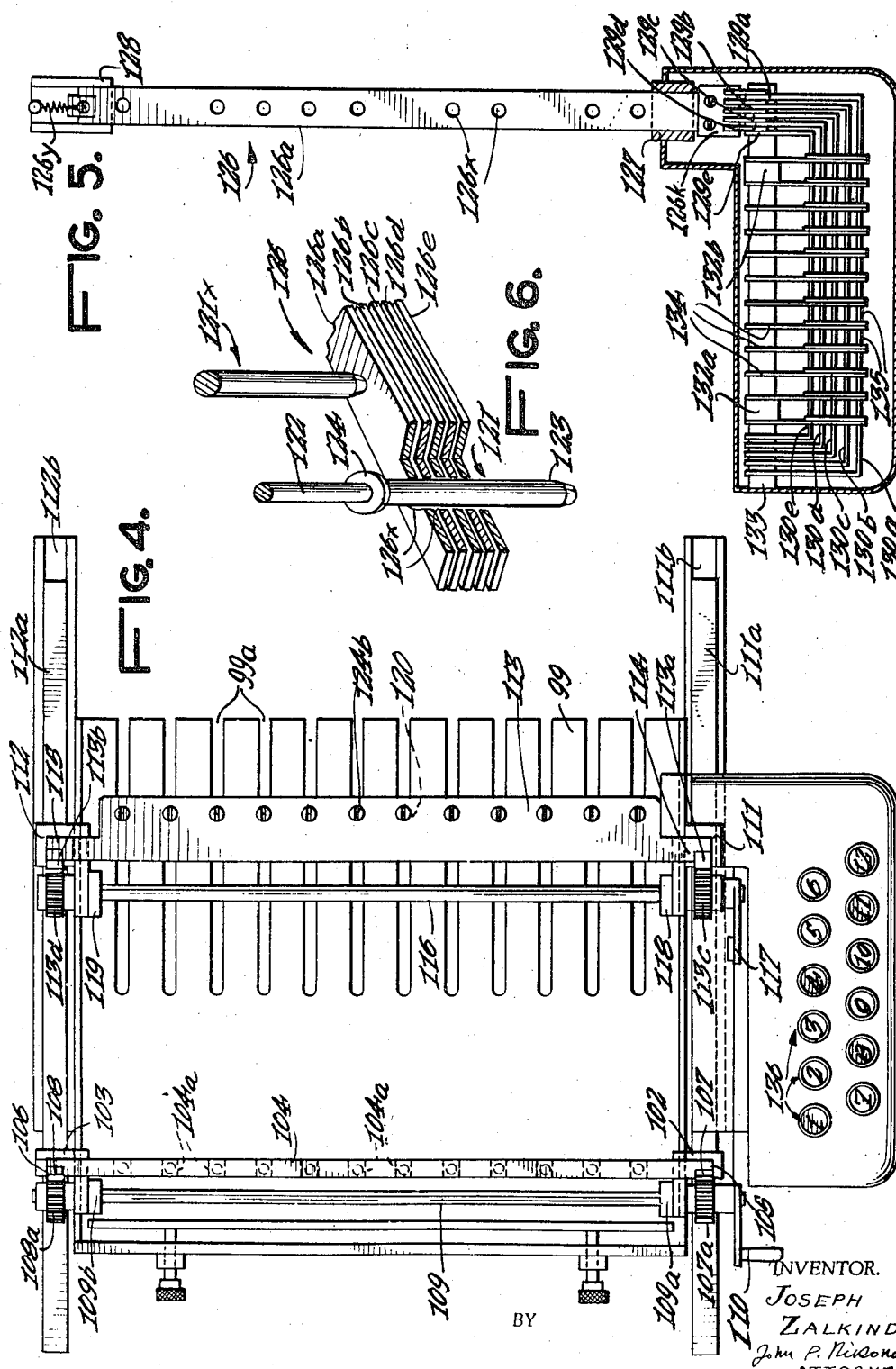
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MACHINE FOR SORTING AND SEPARATING SHEETS OR PRINTED FORMS

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4 Sheets-Sheet 2



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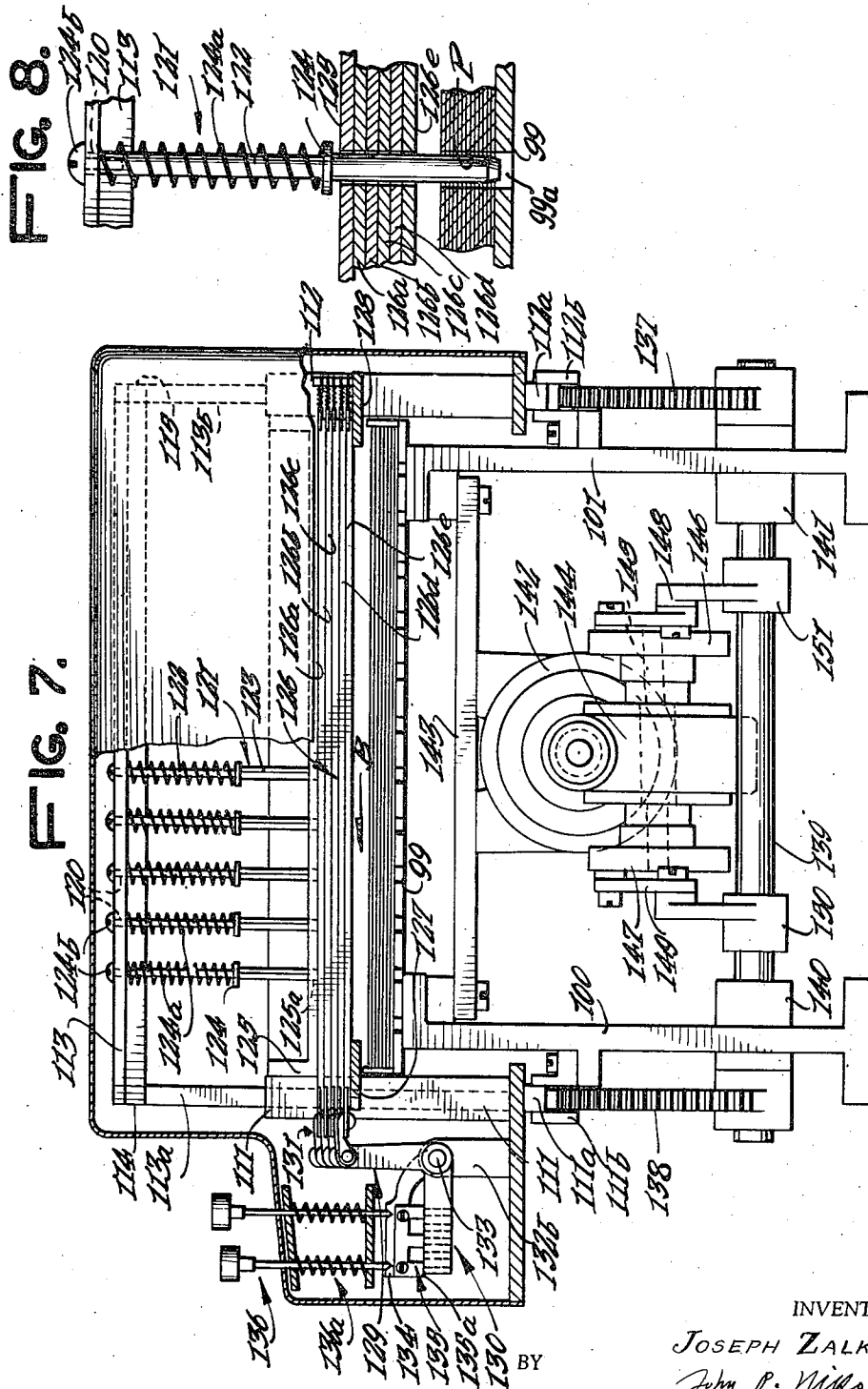
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MACHINE FOR SORTING AND SEPARATING SHEETS OR PRINTED FORMS

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4 Sheets-Sheet 3



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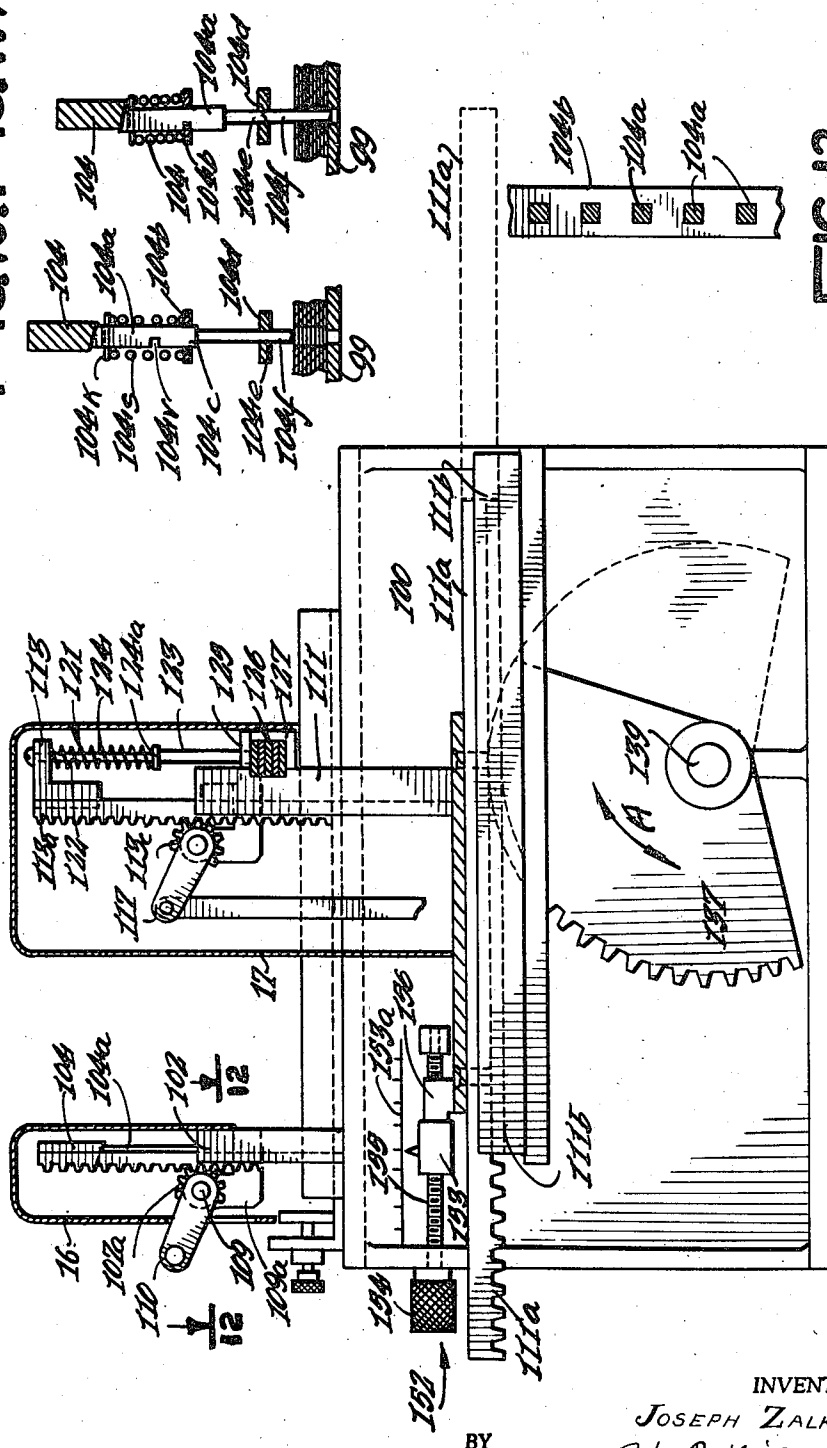
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MACHINE FOR SORTING AND SEPARATING SHEETS OR PRINTED FORMS

Original Filed May 31, 1941. 4 Sheets-Sheet 4

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UNITED STATES PATENT OFFICE

2,359,705

MACHINE FOR SORTING AND SEPARATING
SHEETS OR PRINTED FORMS

Joseph Zalkind, New York, N. Y.

Original application May 31, 1941, Serial No.
396,058. Divided and this application Novem-
ber 3, 1942, Serial No. 464,404

5 Claims. (Cl. 129—16.1)

My invention relates to machines for sorting and separating sheets or printed forms, and has particular reference to a machine for sorting and separating printed forms of one kind from a pile containing different kinds of forms, including such forms as invoices, purchase orders, statements, etc., which may be bound in manifold books, or in the so-called "snap-out" style.

This is a divisional application of my application Serial No. 396,058, filed May 31, 1941, now Patent No. 2,313,285, dated March 9, 1943.

My invention has for its object to provide a machine for sorting and separating forms of the type disclosed in my foregoing patent application. It is especially adapted to sorting sheets of paper or printed forms which are used in multiple forms interleaved with carbon or transfer sheets in which two or more copies of the same matter are made at the same time. In present practice, the person who makes these records does not have the time, at the time that such records are made, to sort the various sheets out into separate piles, so that all the copies are placed together and each set is piled indiscriminately on top of the other. These piles are then sorted out by hand; the person who sorts these sheets must thus handle each sheet of paper separately and must segregate each sheet individually into its proper pile. All this work is very slow and laborious.

With my invention, the sheets of one particular kind are sorted in such a manner that the sheets or forms of another kind are left within the pile stack while the first kind of sheets are withdrawn from the stack.

Forms of the general type herein referred to are used in practically all operations and under a wide variety of conditions, such as those which are found in offices, factories, stores, and shipping establishments. My system has also an important advantage in avoiding handling of carbon paper, when the latter is used with such forms. The forms, therefore, remain untouched by hand while being withdrawn from the pile and cannot be soiled when my invention is used.

Another object of this invention is to provide a mechanism for gripping some sheets and holding same in position while others are being drawn out, and means for dropping said sheets from the mechanism, when the drawing out or pulling function is completed.

With the above indicated objects and advantages in view, as well as others which will hereinafter appear, the invention resides in certain novel constructions, methods of operation, and

arrangements of parts, the essential features of which are herein clearly described, and fully illustrated in the accompanying drawings, in which:

Fig. 1 is a top plan view of a stack of forms constructed in accordance with this invention;

Fig. 2 is a separated view in perspective of forms of Fig. 1, in which the members are spaced apart, for clarity, and with which operating pins or instruments are shown;

Fig. 3 is a bracketed top plan view of the forms of Fig. 2;

Fig. 4 is a partial top plan view of a form selecting or sorting machine, some parts being omitted for clarity in this view;

Fig. 5 is a top plan view, partly sectional of slide bar selector mechanism;

Fig. 6 is a detail view;

Fig. 7 is a partly sectional side elevation;

Fig. 8 is an enlarged detail view;

Fig. 9 is an elevational view of the right hand side of Fig. 7, and having also some parts in section;

Figs. 10 and 11 are enlarged detail views; and

Fig. 12 is a horizontal section on the line 25—25 of Fig. 9.

Referring in detail to said drawings, individual forms 21, 22, 23, 24 are removed from a group or stack, as shown in Fig. 1, the stack having a binding 20, and perforated or weakened lines 19. The multiple forms of Figs. 1 to 3 are shown as illustrative, and other numbers of forms, more or less than four, may be used in a group or pack.

When the multiple forms are interleaved with carbon sheets, as is sometimes the case, these sheets may be withdrawn with the binding, although in other cases the carbon sheets, not shown, may be perforated in opposite margins, in the same manner as the forms, and then such carbon sheets may be withdrawn selectively, in the same manner as said forms.

In the top sheet 21, Figs. 1 to 3, is provided in its holding side, a slot 38 and perforations or apertures 27, 28, 29, and on the opposite or pulling side of said sheet transverse to said slot and apertures, is a marginal line of openings, consisting of an aperture 30, and slots 35, 36, 37.

The second sheet 22 is provided on its holding side with a perforation 26, a slot 39 and perforations 28, 29. On its pulling side the sheet 22 has a slot 34 in line with the perforation 26, a slot 36, in line with the perforation 28, and a slot 37 on the transverse line of the perforation 29.

On the holding side of the third sheet 23, are perforations 26, 27, a slot 40, and the perforation

29. On its pulling side the sheet 23 has a slot 34, on the line of the perforation 26, a slot 35 in line with the perforation 27, the perforation 32 on the line of the slot 40, and the slot 37 in line with the perforation 29.

The bottom sheet 24 has in the margin of its holding side apertures 26, 27, 28, and a slot 41, and in the opposite margin of the sheet 24, are a slot 34, slots 35 and 36, as well as the aperture 33, the latter being opposite the slot 41.

During the selecting or sorting operation, all of the sheets are maintained entirely flat and mutually engaged so that lifting or disturbing any portion of a sheet, such as a margin, from its flat engaging position, as differing from sorting operations heretofore practised, is unnecessary and not called for. In this way, as an advantage of compact arrangement, a stack of sheets may be placed upon a base, as of a machine, and immediately above the pack, or even contacting with the top member thereof, another part, such as a plate or bar of the mechanism, may be disposed, as hereinafter additionally brought out.

Referring to Fig. 2, as one or a primary instance of operation, when it is desired to pull out a sheet 21 from the pack, a holding pin 104a is placed in the pile through the slot 38 of said sheet, and through the perforations 26 of the sheets 22, 23, 24. A pulling pin 121 is placed in the pile through the perforation 30 of the sheet 21, and through the slots 34 of the sheets 22, 23, 24. Upon moving the pin 121 transversely, the sheet 21 only is pulled out, because the other three sheets have slots therein and therefore remain in the pile.

The reason why the three sheets last mentioned remain in the pile is that they have therein apertures 27, 28, 29, in which is the holding pin 104a, and this pin is movable transversely because of the slots 34 in the other three sheets 22, 23, 24.

To pull out the sheet 22, the holding pin 104a (Fig. 2) is placed in the set of perforations 27 and slot 39, on the holding side of the sheets, and the pulling pin 121 is inserted through the perforation 31 and through the set of slots 35. Since the slot 39 is on the holding side of the sheet 22, on this transverse line, and the perforation 31 being on the pulling side, when the pin 121 is moved transversely said latter sheet only is withdrawn.

By placing the holding pins in the apertures 26, 27, 29 of the sheet 23, which has a slot 40 on the third transverse line, on the holding side and by using the drawing pin in the aperture 32 on the drawing side of said line, the sheet 23 may be withdrawn, said sheet 23 having on the drawing side the slots 34, 35, 37.

Likewise, the sheet 24, having on the drawing side of the fourth transverse line the aperture 33, with the non-obstructing slot 41 on the holding side of said line, may be withdrawn, since in said sheet, the slots 34, 35, 36 are non-obstructing, allowing it to come out, and the apertures 29, with the holding pin retain the sheets 21, 22, 23.

The sheets or forms 21, 22, 23, 24, may be pulled out in any other order than that given above.

The slots and perforations on one side or end of a sheet need not necessarily be on the same transverse lines with those on the opposite end, nor is it necessary that the perforations on the holding side be in the same order or sequence as the corresponding slots on the pulling side or vice versa.

In actual practice, a number of multiple forms having predetermined perforated and slotted sheets are stacked in a pile, and then, first, all the sheets of one kind, instead of just one sheet as in the example given above, are withdrawn at one operation from the pile, after which all the other sheets of another kind are withdrawn, and so on until all the sheets of the different kinds in the pile are sorted.

In Fig. 4 is illustrated an embodiment of a machine for automatically separating different kinds of sheets of paper.

Referring to Fig. 4, 99 is a base plate which is supported upon a pair of side frames 100 and 101, Fig. 7. A pair of U-shaped upright members 102 and 103 is supported upon the base plate 99. An elongated bar 104 having both ends 105 and 106 attached to racks 107 and 108 respectively is provided and made to slide up and down within the U-shaped upright members 102 and 103. The up and down motion of the bar 104 is made possible through the medium of the gear racks 107 and 108 and the gears 107a and 108a. The gears 107a and 108a are attached to a shaft 109 and are in mesh with the gear racks 107 and 108.

On said members 102, 103 are bearings 109a, 109b, and in these bearings the shaft 109 is journaled. When the shaft 109 is rotated manually through the medium of the handle 110, the bar 104 is moved upwards or downwards as required, depending on the operation of the separator mechanism shown in Fig. 4. Above the bar 104 is a housing portion 16 and above the bar 113 a portion 17.

Another pair of U-shaped members 111 and 112 is attached at the opposite end of the device and to the slidably movable rack members 111a and 112a. The members 111a and 112a slide horizontally within channel-shaped ways 111b and 112b which are attached to the side frames 100 and 101 respectively (see Fig. 7).

A cross bar member 113 has a gear rack 113a attached to one of its ends 114 and another gear rack 113b attached to its other end 115. A pair of gears 113c and 113d is attached to the shaft 116. The gears 113c and 113d are in mesh with the gear racks 113a and 113b and are rotated by operating a handle 117. The shaft 116 turns within bearings 118 and 119 which are attached to the U-shaped members 111 and 112 respectively. The cross bar 113 has a number of openings upon its entire length. A number of selector pins 121 are located within the openings 120. The pins 121, each alike, consist of a narrower portion 122 with a wider portion 123, and a washer 124 is attached to each of the pins 121. A spring is wound around the narrow part 122 of the pin 121 in such a manner as to keep said pin always under tension. A secondary but stationary cross bar 125 is attached to the U-shaped members 111 and 112 respectively. The wider ends 123 of the pins 121 are disposed within openings 125a located in the cross bar 125 and these openings are in alignment with the openings 120 located in the cross bar 113. Screw heads 124b prevent the pins 121 from disengaging from the cross bar 113.

A row of selector bars 126 (in this case there are five) is provided. The bars 126a, 126b, 126c, 126d and 126e are located below the cross bar 125. The bars 126 are slidably supported within the channel shaped members 127 and 128 and are made to slide underneath the cross bar 125 through the action of hingeably movable arms

The arms 129 are joined in each case to a number of U-shaped members 130 (in this case there are five U-shaped members 130a, 130b, 130c, 130d and 130e). The arms 129 also comprise five separate arms (in this case arms 129a, 129b, 129c, 129d, and 129e) and are connected with the selector bars 126 by five fingertips 131. Each finger 131 (see Fig. 7) has one end hingeably attached to an end of an arm 129, and an opposite end formed with a hook which holdingly engages in an aperture of an end portion 126k of a bar 126.

The five U-shaped members 130 are made to hinge upon the supporting bearings 132a and 132b through the medium of the shaft 133. A number of bent fingers 134 (in this case there are twelve such fingers) are also hingeably supported upon the shaft 133. The forked members 135 are attached to the fingers 134 by screws, as shown. The members 135 are all of different shape (there are twelve forked members 135 in this case), their shape depending on the combination or number of U-shaped members 130; they are adapted to operate when the keys 136 are depressed.

To operate the rack members 111a and 112a there is provided a pair of segmental gear members 137 and 138. The gears 137 and 138 are attached to a shaft 139 that is made to rotate within the bearings 140 and 141 which are located upon the side frames 100 and 101 respectively. An electric motor 142 is fastened below the base plate 99 of the machine through the medium of a cross member 143. The motor 142 has a reduction gear box 144. A driving shaft 145 extends on both sides of the gear box 144 and carries a pair of disc-like members 146 and 147. Through the medium of a pair of connecting links 148 and 149, which are attached to the disc-like members 146 and 147 and also to a pair of arms 150 and 151, the shaft 139 is given a rocking motion as shown by the arrow A, and broken lines in Fig. 9. This rocking motion operates the segmented gears 137 and 138 which transfer this motion to the slidably mounted gear racks 111a and 112a. It is understood that the shaft 139 can be also operated manually through a handle, not shown, attached to the shaft or through any other mechanical or manual means.

The operation of the device shown in Figs. 4 to 12 inclusive is as follows:

The stack of perforated and slotted papers, printed forms, or the like to be sorted, and similar to the paper forms as shown and described in Figs. 1 to 3, is placed upon the base plate 99 of the device. In the device shown and described in Figs. 4 to 12 of this specification there can be sorted as many as twelve different kinds of printed perforated and slotted forms (there are provided twelve separating pins in this device).

The keys 136 are designated with numerals or any other sort of designation and each key represents one particular kind of form to be sorted (in this case the numerals, as designated 1, 2, 3, to 12, represent twelve different kinds of forms to be sorted and these numerals are marked upon their respective keys. (See Fig. 4.)

After the stack has been placed upon the base plate 99 of the device, the operator rotates the shaft 109 by operating the handle 110. This operation will rotate the gears 107a and 108a and move the gear racks 107 and 108 downwardly. Since the cross bar 104 is attached to the gear racks 107 and 108, this downward movement of the gear racks will move the cross bar down and up on the square pins 104a. The pins 104a are

held upright by a cross bar 104b located under the cross bar 104, and having a row of square holes 104c for the pins 104a, and by a secondary elongated cross bar 104d located under the bar 104b having a row of round holes 104e for the rounded ends 104f of the pins 104a. A spring 104s is located between the cross bar 104b and a cross pin 104k, said pin being a part of the square pin 104a. This spring keeps the pin 104a always under tension until the pin is depressed by the downward movement of the cross bar 104 as described above.

Due to the fact that every square pin, which in this case can be called a holding selector pin to differentiate from the pulling selector pins 121, is arranged to register with a perforation in the stack of paper forms, the downward motion of said pins will locate said pins within the perforations of the stack.

To hold the holding selector pin in position, after it has been moved into the stack perforation, a grooved portion 104v is located upon the pin 104a. At the downward movement of the pin 104a, and when the groove 104v reaches the cross bar 104b, the pin 104a, having an inclined top face, as shown, will snap into the position shown in Fig. 11, and stay in this place until further released automatically or manually.

The next step in the operation is to bring about the pulling function, through the perforations located on the opposite end of the stack. This is accomplished through a gauge mechanism 152 which is located on the side of the machine (see Fig. 9).

The gauge mechanism consists of an adjustable stop member 153 and a scale 153a. The adjustable stop member 153 is operated by a knob 154 and a screw 155. The slidable gear rack 111a has a permanent stop 156 which is brought in contact with the adjustable stop 153 when aligning the pulling selector pins 121 with the perforations of the pile stack.

After the alignment has been made, the operator depresses the proper key 136 which is under the tension of a spring 136a. Every one of the twelve keys in this case is in contact with one of the bent arms 134 that carry the selector forks 135. The selector forks 135 are made in such a manner that, depending on the position and the number of their extension fingers 135a, a different number of combinations can be arranged. Due to the fact that the extension fingers 135a are contacting the U-shaped members 130, every time a different key is depressed a different kind and number of U-shaped members 130 can be operated. In the case as shown (see Figs. 5 and 7), the forked member 135 has three extension fingers 135a arranged in such a manner that the U-shaped members 130a, 130c and 130e will be operated.

The operation of these three members will bring into motion three of the arms 129. These are the arms 129a, 129c, and 129e. As these arms are attached to the sliding selector bars 126 by the fingertips 131 three of said selector bars will slide in the direction indicated by the arrow B. These bars will be: the bars 126a, 126c and 126e.

As can be seen in Figs. 5 and 6, the bars 126 are perforated with holes 126x. The perforations 126x are arranged in such manner upon each of the bars 126 that, on a particular sliding motion of some of the bars, one particular perforation of each of the bars will be in alignment with one particular perforation on each of the other bars.

In other words; to a certain selective position of the selector bars 126 only one certain perforation located upon each of said selector bars will be in alignment with another certain perforation located upon the other bars. In Fig. 6, there is shown such a position. It can be seen there that the pin 121 passed all the perforations of the five bars while another pin 121x has been stopped by the top selector bar 126a.

The same selective operation of the key mechanism can be repeated many times (in this case twelve times) depending on the key that is depressed by the operator.

Now, one of the keys 136, being depressed by the operator, and the selective operation being finished by the selector bars, the handle 117 is operated manually or automatically. The rotation of this handle will operate the shaft 116, gears 113c and 113d and the gear racks 113a and 113b. As the cross bar 113 is attached to the gear racks 113a and 113b said cross bar will be moved downwardly and force the selector pins onto the top of the selector bar 126. As only one pin at a time is permitted to enter a selected perforation set, the other pins will be forced upon their respective springs 124a depressing the springs but not entering any perforations of the selector bars 126.

The selector pin that has passed through the selected perforations of the selector bars, enters into the perforations *p* of the stack (see Fig. 8) and now is ready to pull the forms, in which are these perforations, from the rest of the pile. The rounded or beveled end of each pin portion 122 may slightly enter a slot, as 99a, in the base plate 99.

The sorting or pulling off operation is done through the sliding motion of the gear rack members 111a and 112a and the rocking motion of the gear segments 137 and 138 that are operated by the electric motor 142. To this purpose an electric switch (not shown) is pressed by the operator, allowing the motor to operate the shaft 139 once to the right and then to the left.

The motor to the right of gear rack members 111a and 112a will pull the selected forms from the rest of the pile or stack and the motion to the left will cause the selector mechanism to return to its original starting position for further use. It is understood that the rest of the sheets of the pile or stack are selected and pulled off in similar manner and the operator has to go through the same motion to select all the forms in the pile stack up to the last kind.

Variations may be resorted to within the scope of the invention as set forth in the appended claims, and parts of the improvements may be used without others.

I claim as my invention:

1. A machine for sorting and separating sheets or printed forms, the latter having openings including slots and apertures near one of their edges and similar slots and apertures near the opposite edge; the machine comprising a base for supporting a stack of the forms; a group of holding pins above the stack in coordination with the openings at one edge of the stack; a group of pulling pins above the stack in coordination with the openings at the opposite edge of the stack; a member slidably supporting the holding pins; means to slidably support the member above the base for movement in a vertical direction; a second member slidably supporting the pulling pins and slidably supported by a supporting means on the base for movement in a vertical direction;

means to slidably support the second pin supporting member in a horizontal direction; means to yieldably urge all pins downward; means to move the first member against the stack for causing the holding pins to enter the openings; means to move the second member against the stack; means to admit one pulling pin to enter an opening in a selected sheet while preventing the other pulling pins from entering the openings in the stack; a rack on the second pin supporting member; a gear in mesh with the rack; means to rotate the gear for moving the pulling pins away from the first member thereby separating the selected sheet from the stack; means to retain the holding pins in engagement with the stack when the member with the pulling pins is moved away from the holding pins; and means to release the holding pins when the member with the pulling pins is returned to its original position.

2. A machine for sorting and separating sheets or printed forms, the latter having openings including slots and apertures near one of their edges and similar slots and apertures near the opposite edge, the machine comprising a base for supporting a stack of the forms; a group of holding pins above the stack in coordination with the openings at one edge of the stack; a group of pulling pins above the stack in coordination with the openings at the opposite edge of the stack; a member slidably supporting the holding pins in a parallel alignment; means to slidably support the member above the base for movement in a vertical direction; springs urging the holding pins downward; a second member slidably supporting the pulling pins in a parallel alignment; springs urging the pulling pins downward; means to slidably support the second member on the base for movement in a vertical direction; means to slidably support the supporting means of the second member for movement along the base; a plurality of bars slidably supported above the stack under the holding pins; a plurality of bars slidably supported above the stack under the pulling pins, the bars having differently positioned holes for the pins; manually operable keys on the base; operative connections between the keys and the bars for bringing bars with the holes in register with selected holding pins and with selected pulling pins when a selected key is depressed; a rack attached to the second member; a gear in mesh with the rack; and a motor for operating the gear thereby moving the second member with the pins engaging holes in selected sheets away from the first member and pulling out the selected sheets from the stack.

3. A machine for sorting and separating sheets or printed forms, the latter having openings including slots and apertures near one of their edges and similar slots and apertures near the opposite edge; the machine comprising a base for supporting a stack of the forms; a group of holding pins above the stack in coordination with the openings at one edge of the stack; a group of pulling pins above the stack in coordination with the openings at the opposite edge of the stack; a member slidably supporting the holding pins in a parallel alignment; means to slidably support the member above the base for movement in a vertical direction; springs urging the holding pins downward; a second member slidably supporting the pulling pins in a parallel alignment; springs urging the pulling pins downward; means to slidably support the second member on the base for movement in a vertical direction; means to slidably support the sup-

porting means of the second member for movement along the base; a plurality of bars slidably supported above the stack under the holding pins; a plurality of bars slidably supported above the stack under the pulling pins, the bars having differently positioned holes for the pins; manually operable keys on the base; operative connections between the keys and the bars for bringing bars with the holes in register with selected holding pins and with selected pulling pins when a selected key is depressed; vertical racks on the holding pin supporting member; a gear in mesh with each of the racks; means to rotate the gears for moving the racks with the member and pins downward for causing the holding pins to enter the selected holes in the forms; vertical racks on the second member; gears in mesh with the second member racks; means to rotate the second gears for moving the second member downward for causing the pulling pins to enter the selected holes; a motor; and means to move by the motor the second member away from the first member for pulling out the selected sheet.

4. A machine for sorting and separating sheets of printed forms with openings including slots at the opposite edges, the machine comprising a base for supporting a stack of the forms; a row of holding pins for the openings at one side of the stack of forms; a frame vertically supported on the base slidably supporting the pins; a U-shaped member slidably supported on the frame engaging the pins; bars slidably supported under the pins having openings for the pins; means to selectively move the bars for placing openings under selected pins; a second frame above the other side of the stack of the forms; a row of pulling pins slidably supported in the frame; a second U-shaped member slidably supported in the second frame engaging the pulling pins; bars slidably supported under the pulling pins having openings for the pulling pins; means to selectively place the bars under the pulling

pins with holes under selected pins; racks on the U-members; gears engaging the racks; means to rotate the gears for moving the U-members downward and causing the selected holding and pulling pins to enter the holes in the forms; a horizontal rack on the second frame; a gear in mesh with the horizontal rack; and means to rotate the last named gear for moving the second frame away from the first frame thereby pulling the selected form from the stack.

5. A machine for sorting and separating sheets of printed forms with openings including slots at the opposite edges, the machine comprising a base for supporting a stack of the forms; a row of holding pins for the openings at one side of the stack of forms; a frame vertically supported on the base slidably supporting the pins; a U-shaped member slidably supported on the frame engaging the pins; bars slidably supported under the pins having openings for the pins; means to selectively move the bars for placing openings under selected pins; a second frame above the other side of the stack of the forms; a row of pulling pins slidably supported in the second frame; a second U-shaped member slidably supported in the second frame engaging the pulling pins; bars slidably supported under the pulling pins having openings for the pins; means to selectively place the bars under the pulling pins with holes under selected pins; racks on the U-members; gears engaging the racks; means to rotate the gears for moving the U-members downward and causing the selected holding and pulling pins to enter the holes in the forms; a horizontal rack on the second frame; a gear in mesh with the horizontal rack; means to rotate the last named gear for moving the second frame away from the first frame thereby pulling the selected form from the stack; and a gauge device on the second member for adjustably limiting the movement of the second member.

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