R. A. FREEMAN.

SHEET FEEDING MACHINE.

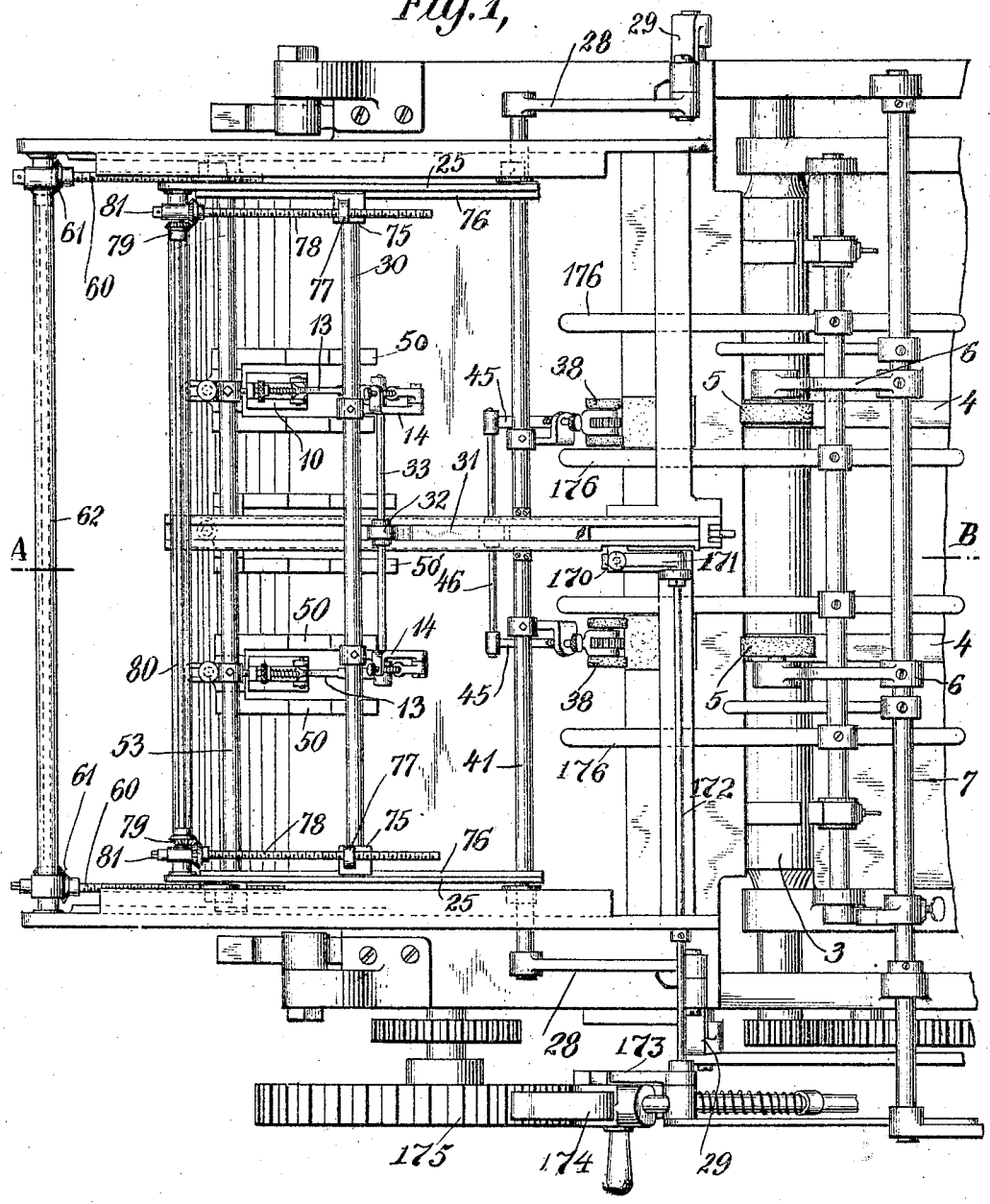
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1,087,533.

Patented Feb. 17, 1914.

2 SHEETS—SHEET 1.

Fig. 1.



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2 SHEETS—SHEET 2.

Fig. 2,

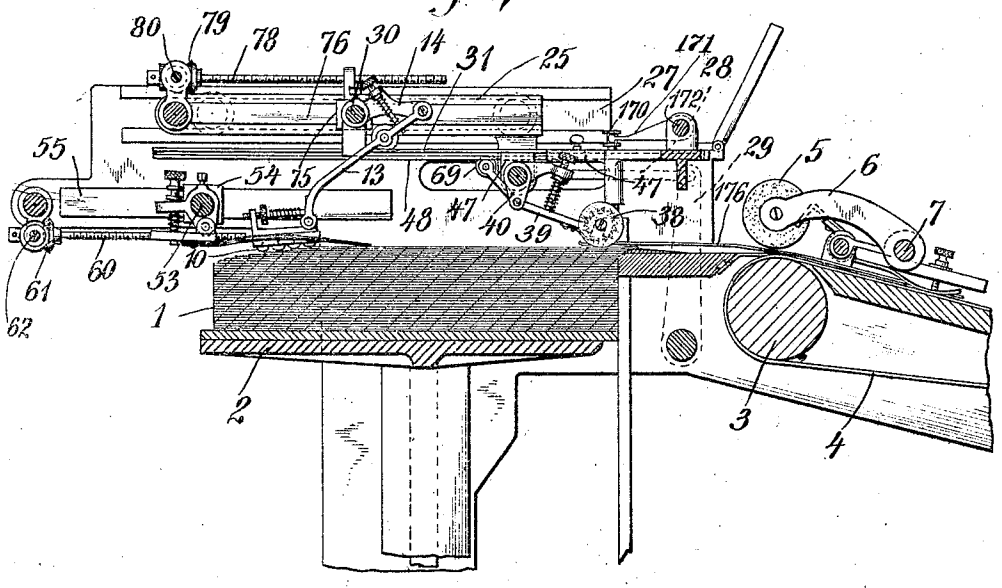


Fig. 3,

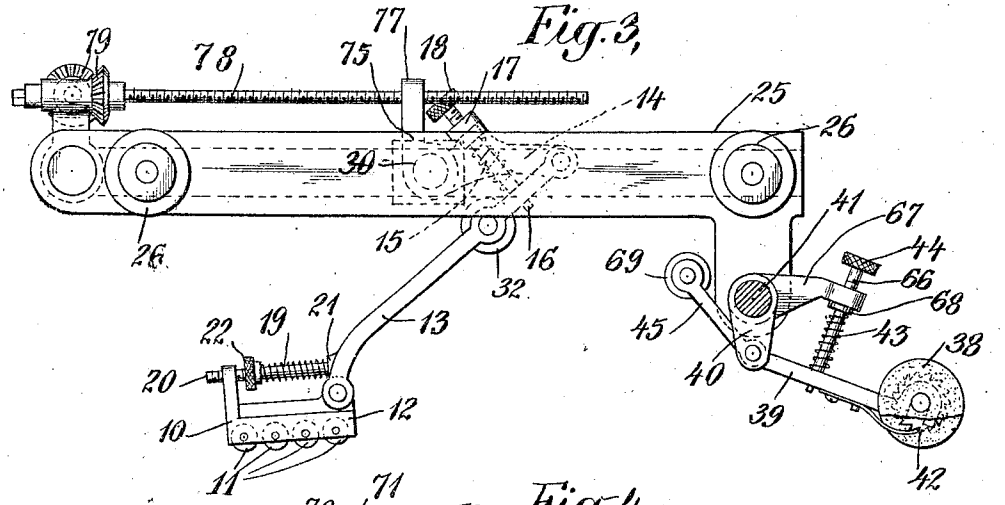
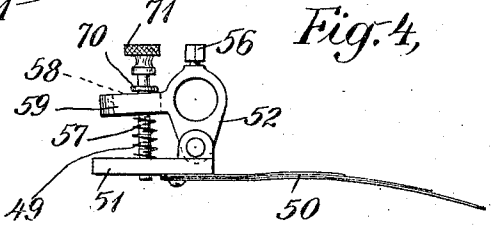


Fig. 4,



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SHEET-FEEDING MACHINE.

1,087,533.

Specification of Letters Patent. Patented Feb. 17, 1914.

Application filed May 11, 1910. Serial No. 560,572.

To all whom it may concern:

Be it known that I, RUFUS A. FREEMAN, a citizen of the United States, and a resident of Flushing, Queens county, State of New York, have invented certain new and useful Improvements in Sheet-Feeding Machines, of which the following is a specification.

The invention relates to automatic sheet feeding machines and more particularly to machines for separating sheets from a stack.

My invention has for an object to provide a novel mechanism for separating the sheets from a stack and delivering them from the stack one at a time with certainty and at high speed; also to provide such a mechanism which may be readily adjusted to operate upon sheets of various sizes and qualities. These and other objects of the invention will in part be obvious and will in part more fully appear herein.

The invention consists in the novel parts, constructions, arrangements, combinations and improvements herein shown and described.

The accompanying drawings, referred to herein and forming a part hereof, illustrate one embodiment of the invention, the same serving in connection with the description herein to explain the principles of the invention.

Of the drawings:—Figure 1 is a top plan of a sheet feeding machine embodying the principles of the invention; Fig. 2 is a central longitudinal section, substantially on the line A—B of Fig. 1; Fig. 3 is a detail elevation, on an enlarged scale, of certain combing and feeding off devices; and Fig. 4 is a detail, also on an enlarged scale, of a sheet holding device for regulating the combing and feeding off action on the sheets.

Referring to the accompanying drawings, illustrating by way of example one embodiment of the invention, a stack of sheets 1 is placed upon a suitable support, such as the table 2. Conveniently located with respect to the sheet stack to receive the separated sheets are sheet forwarding devices of suitable form. The form of such devices illustrated herewith comprises a driven roller 3, carrying tapes 4 and located above and co-operating therewith, drop rollers 5. Said drop rollers 5 are mounted upon arms 6 fixed to a shaft 7, said shaft being controlled by suitable means (not shown herein).

A combing device 10 comprising a series of rolls 11 arranged substantially in a plane is mounted in a suitable frame 12. Said combing device 10 is further shown pivotally mounted on an arm 13 at or near one end of said frame 12. The arm 13 is in turn pivotally carried upon a bracket arm 14. Suitable means are provided for causing the combing device to comb out the sheets, and also for regulating the pressure upon the sheets of the entire combing device, and also the pressure upon the sheets of the parts of the combing device relatively to each other. For this purpose a compression spring 15 is arranged between the arm 13, and a collar fixed on a pin 16, said pin being threaded into a lug 17 on the arm 14, and being provided with a turning head 18 to adjust the spring.

For graduating the pressure of the various combing rolls 11 a spring 19 is provided which exerts pressure between the frame 12 and the arm 13. Said spring is conveniently coiled about a rod 20 threaded into a lug on the frame 12 and is under compression between a bearing surface 21 upon the arm 13 and an adjusting head 22 fixed on the rod 20.

Means are provided for giving movement to the combing devices and the embodied form thereof comprises a carriage 25 slidably mounted in the frame of the machine, and which may be provided with suitable rollers 26 running in guideways 27 upon the machine frame. A reciprocating movement is communicated to the carriage 25 by any suitable means, such as the links 28 connected to levers 29, which levers may be rocked by any suitable mechanism. In the illustrated embodiment two combing mechanisms such as has just been described, are shown acting upon the back ends of the sheets at the top of the sheet stack. The two combing mechanisms are located on opposite sides of the longitudinal central line of the sheet stack, as shown in Fig. 1. It will be understood, however, that a different number and arrangement may be made, so far as concerns many features of the invention.

The bracket arms 14 of both combing mechanisms are shown fixed to the shaft 30, which shaft is mounted in the carriage 25. To lift the combing devices 10 clear of the sheets during the return movement thereof after each combing action, the arms 13 are swung about their respective mountings on

the bracket arms 14. The illustrated form of means for effecting this comprises a cam 31 coacting with a roll 32 on the rod 33 extending between the two arms 13. Said parts and the parts coöperating therewith may be constructed and arranged and also may operate in the manner described in my copending application Serial No. 395,388, and need not be described herein in detail. The combing devices are also adjustable on the carriage 25 backward and forward in the same direction as the combing movement to bring them into proper relation for separating sheets of different sizes. For this purpose the ends of the rod 30 are carried by blocks 75 slidably mounted in guideways 76 in the carriage frame. Fixed to the blocks 75 are lugs 77 into which are screw threaded rods 78 connecting by miter gears 79 with a cross shaft 80. Turning heads 81 are shown on the ends of the rods 78, the shaft 80 and connections causing the two rods and therefore both blocks 75 to move together.

Feeding off devices for delivering the sheet from the stack to the drop rollers 5 and the tapes 4 are provided. The form of such means shown comprises pusher fingers or rolls 38, mounted upon arms 39, which arms are pivotally carried by the carriage 25. Two rolls 38 and arms 39 are shown mounted at either side of the longitudinal center line of the sheet stack. Each arm 39 is shown pivotally attached to a bracket 40. Both of the brackets 40 are adjustably mounted upon a cross rod 41 of the carriage 25. The rolls 38 may be provided with a ratchet and detent 42, in a well known manner, to permit a fresh bearing surface to be brought into operative position as desired and to prevent movement thereof during the feeding off of the sheet. Means for placing and regulating pressure upon the rolls 38 are provided, and the embodied form thereof comprises a spring 43 shown coiled about a rod 66, screw threaded into an arm 67 fixed to the bracket 40. The spring 43 bears against a collar 68 on the rod 66, and the rod is turned in its threaded bearing in the arm 67 by means of the head 44 to regulate the pressure of the spring 43 on the roller 38.

Means are provided for causing the rolls 38 to pass out of contact with the face of the sheet stack during their idle or return movement after the feeding off of the sheets, and the form of such means shown comprises arms 45 between which is a rod 46 carrying a roller 69 coöperating with a suitable cam 47 and other mechanisms (not shown) which may be substantially of the form illustrated and described in my said copending application Serial No. 395,388. The bar 48 carrying the cams 31 and 47 as shown in the present drawings corresponds substantially to the bar 44 shown in said copending application and has substantially the same functions and does not need to be described in further detail.

In accordance with one feature of the invention, a sheet holding device is provided which contacts with the rear end of a sheet to hold it against the action of the feeding off device when the latter is acting through another sheet but said sheet holding device does not hold the sheet against the action of the combing devices. Said sheet holding device acts on the rear end of the sheet next to the top sheet of the stack to hold it against the action of the feeding off device when the latter is acting upon the top sheet to deliver it to the drop roller 5 and the tapes 4. In the embodied form an inherently resilient finger 50 is shown which may be of several plies of flat steel of different lengths. The free end or effective contact portion of the finger 50 is made rigid and abrupt or with a small effective contact area adapted to effect a nipping contact with the sheet to hold it with certainty until the top sheet is forwarded off and the forwarding means act directly upon the sheet engaged by the finger. When this sheet is forwarded beyond the finger, the latter engages the rear end of the next sheet and effectively holds it against the action of the forwarding devices, and so on; this action being rendered possible by reason of the separation of the sheets due to the combing devices. Said spring finger 50 is fastened to a piece 51 pivotally mounted upon the lug 52. Said lug is slidably mounted upon the rod 53 which is mounted transversely of the machine frame. The rod 53 is also slidable backward and forward longitudinally of the machine frame, and for this purpose said rod is carried by blocks 54 slidable on the guide 55 in the carriage frame. A binding screw 56 serves to hold the lug 52 in position on the rod 53.

Means are provided for the purpose of adjusting the pressure of the spring fingers 50 upon the sheet stack to regulate the pressure so the sheet will be held firmly until it is the top sheet and the forwarding devices act on it direct when it will be fed off against said pressure. The form of such means shown comprises a screw rod 57 threaded in the piece 51 and passing through a slot 58 in an extension 59 of the lug 52. A spring 49 is coiled about the rod 57 and under compression between the parts 51 and 59. The rod 57 is provided with a fixed collar 70 which bears upon the upper face of the part 59. Said rod 57 is also provided with a head 71 for convenience in turning. As the rod 57 is rotated in one direction, it increases the pressure of the fingers 50 on the top of the sheets, and when rotated in the opposite direction it decreases such pres-

sure. The spring 49 serves to keep the finger substantially horizontal when not resting on the sheets, thereby facilitating the adjustment of the machine.

According to one feature of the invention, the holding devices are arranged to engage the sheets contiguous to and at either side of a combing device. Two fingers may be carried upon a single piece 51, said fingers being spaced apart, whereby the combing device may reciprocate between the fingers. The edge of the paper is thus kept taut and smooth where the combing device acts upon it, and the tearing of the edge of the sheet by the combing device is prevented. In Fig. 1 such an arrangement is shown for each combing device. By independently adjusting the combing devices and the holding fingers, the latter serves, among other things, to modify the operation of the former, the rate of combing of the sheets may be nicely regulated and regulated independently at opposite sides of the stack so that the sheets will be advanced with their front edges substantially at right angles with the path of travel. In said figure also there are shown two centrally located fingers 50′ which are longer and contact with the sheet a little forward of the sets of fingers at either side, in position to nip and hold any second sheet which might not be held by the side sets of fingers.

Means are provided for adjusting the slidable blocks 54 along the guides 55 to position the fingers 50 for sheets of different sizes and for keeping said fingers 50 in proper relation to the combing devices and the feeding off devices so that they may act properly on the next to the top sheet. The illustrated form of such adjusting means comprises threaded shafts 60, threaded into lugs upon the blocks 54, and turned in unison by suitable means, such as the miter gears 61, and shaft 62.

Suitable means are provided for keeping the top of the sheet stack in proper relation to the separating devices. The form of such means shown comprises a detector 170 connected to an arm 171 fixed to a shaft 172, which controls a check lever 173. Said check lever controls the movement of the pawl 174, to permit or prevent the actuation of the ratchet wheel 175 by the pawl, the ratchet wheel being suitably connected with the support 2 for the sheet stack. The particular form of said devices are not a part of the present invention and need not be described in further detail.

The fingers 176 serve to guide the sheets between the roll 4 and drop rollers 5.

The invention, in its broader aspects, is not limited to the particular constructions shown, nor to any particular constructions by which it has been or may be carried into effect, as many changes may be made in the construction without departing from the main principles of the invention and without sacrificing its chief advantages.

What I do claim as my invention and desire to secure by Letters Patent, is:

1. A sheet separating mechanism including in combination means for supporting a stack of sheets, a combing device, a feeding off device, and a holding device having an abrupt, rigid contact portion arranged to engage a sheet near its rear end and hold it against the action of the feeding off device when the latter is acting through another sheet but not against the action of the combing device.

2. A sheet separating mechanism including in combination means for supporting a stack of sheets, a combing device, a feeding off device, and a holding device having an abrupt, rigid contact portion arranged to engage a sheet near its rear end with a substantially predetermined pressure and hold it against the action of the feeding off device when the latter is acting through another sheet but not against the action of the combing device.

3. A sheet separating mechanism including in combination means for supporting a stack of sheets, a combing device, a feeding off device, a holding device for engaging the rear ends of the sheets, said holding device having an abrupt, rigid contact portion, and means for adjusting the pressure exerted by said contact portion, whereby the holding device will hold a sheet against the action of the feeding off device when the latter is acting through another sheet but not against the action of the combing device.

4. A sheet separating mechanism including in combination means for holding a stack of sheets, a holding device having an abrupt, rigid contact portion, means for adjusting the position of said contact portion to engage the rear ends of the combed out sheets, and means for adjusting the pressure exerted by said contact portion, whereby the holding device will engage a sheet near its rear end and hold it against the action of the feeding off device but not against the action of the combing device.

5. A sheet separating mechanism including in combination means for supporting a stack of sheets, a combing device, a feeding off device, and a plurality of holding devices each having an abrupt, rigid contact portion arranged to engage a sheet near its rear end and hold it against the action of the feeding off device when the latter is acting through another sheet but not against the action of the combing device.

6. A sheet separating mechanism including in combination means for supporting a stack of sheets, a combing device, a feeding off device, and a holding device having a plurality of abrupt, rigid contact portions.

arranged to engage a sheet near its rear end and hold it against the action of the feeding off device when the latter is acting through another sheet but not against the action of the combing device.

7. A sheet separating mechanism including in combination means for supporting a stack of sheets, a combing device, a feeding off device, and a plurality of holding devices, each having an abrupt, rigid contact portion arranged to engage a sheet near its rear end and hold it against the action of the feeding off device when the latter is acting through another sheet but not against the action of the combing device, one of said holding devices being arranged at each side of the longitudinal center line of the sheet stack.

8. A sheet separating mechanism including in combination means for supporting a stack of sheets, a combing device, a feeding off device, and a plurality of holding devices, each having an abrupt, rigid contact portion arranged to engage a sheet near its rear end and hold it against the action of the feeding off device when the latter is acting through another sheet but not against the action of the combing device, one of said holding devices being arranged at each side of the longitudinal center line of the sheet stack, and a third holding device arranged between said first mentioned holding devices.

9. A sheet separating mechanism including in combination means for supporting a stack of sheets, a combing device, a feeding off device, and a plurality of holding devices, each having an abrupt, rigid contact portion arranged to engage a sheet near its rear end and hold it against the action of the feeding off device when the latter is acting through another sheet but not against the action of the combing device, one of said holding devices being arranged at each side of the longitudinal center line of the sheet stack, and a third holding device arranged substantially at said center line of the sheet stack between said first mentioned holding devices.

10. A sheet separating mechanism including in combination means for supporting a stack of sheets, a combing device, a feeding off device, and a plurality of holding devices, each having an abrupt, rigid contact portion arranged to engage a sheet near its rear end and hold it against the action of the feeding off device when the latter is acting through another sheet but not against the action of the combing device, one of said holding devices being arranged at each side of the longitudinal center line of the sheet stack, and a third holding device arranged between said first mentioned holding devices, said third holding device engaging the sheet in advance of the other two.

11. A sheet separating mechanism including in combination means for supporting a stack of sheets, a combing device, a feeding off device, and a plurality of holding devices each having a portion arranged to engage a sheet near its rear end and hold it against the action of the feeding off device when the latter is acting through another sheet but not against the action of the combing device, one of said holding devices being arranged between two others.

12. A sheet separating mechanism including in combination means for supporting a stack of sheets, a combing device, a feeding off device, and a plurality of holding devices each having a portion arranged to engage a sheet near its rear end and hold it against the action of the feeding off device when the latter is acting through another sheet but not against the action of the combing device, one of said holding devices being arranged between two others and engaging the sheet at a point in advance of the points of engagement of the other two holding devices.

13. A sheet separating mechanism including in combination means for supporting a stack of sheets, a combing device, a feeding off device, a plurality of holding devices for engaging the rear ends of the sheets, said holding devices having abrupt, rigid contact portions, and independent adjusting means for adjusting the pressure exerted by each of said holding devices, whereby the holding device will hold a sheet against the action of the feeding off device when the latter is acting through another sheet but not against the action of the combing device.

14. A sheet separating mechanism including in combination means for supporting a stack of sheets, a combing device, a feeding off device and an inherently resilient holding device having an abrupt, rigid contact part to engage the rear end of the second sheet from the top of the stack and hold same while the top sheet is being advanced by the feeding off devices.

15. A sheet separating mechanism including in combination means for supporting a stack of sheets, a combing device, and sheet holding means having abrupt, rigid contact parts acting on the sheets at each side and close to the place of action of the combing device.

16. A sheet separating mechanism including in combination means for supporting a stack of sheets, a traveling combing device, and a sheet holding device having an abrupt, rigid contact part acting on the sheets at each side and close to the line of action of the combing device.

17. A sheet separating mechanism including in combination means for supporting a stack of sheets, a combing device, a sheet forwarding device, and sheet holding means contacting with the sheets at each side and

close to the combing device to hold a sheet against the action of the forwarding device when acting through another sheet but not against the combing device.

18. A sheet separating mechanism including in combination means for supporting a stack of sheets, a combing device, a sheet forwarding device, and sheet holding means having a plurality of abrupt, rigid contact portions contacting with the sheets at each side and close to the combing device to hold a sheet against the action of the forwarding device when acting through another sheet but not against the combing device.

19. A sheet separating mechanism including in combination means for supporting a stack of sheets, a combing device, and also a sheet forwarding device at each side of the longitudinal center line of the sheet stack, and a plurality of holding means arranged to engage a sheet near its rear end and close to each combing device to hold a sheet against the action of the feeding off devices when acting through another sheet but not against the combing devices and similar holding means located intermediately said first mentioned holding means.

20. A sheet separating mechanism including in combination means for supporting a stack of sheets, a combing device, and also a sheet forwarding device at each side of the longitudinal center line of the sheet stack and a plurality of holding means arranged to engage a sheet near its rear end and close to each combing device to hold a sheet against the action of the feeding off devices when acting through another sheet but not against the combing devices and similar holding means located intermediately said first mentioned holding means, and relatively farther from said combing devices.

21. A sheet separating mechanism including in combination means for supporting a stack of sheets, a combing device and also a sheet forwarding device at each side of the longitudinal center line of the sheet stack, and a plurality of holding means arranged to engage a sheet near its rear end and close to each combing device to hold a sheet against the action of the feeding off devices when acting through another sheet but not against the combing devices and similar holding means located substantially centrally said first mentioned holding means.

22. A sheet separator including in combination a traveling combing device acting on the rear edges of the sheets, sheet forwarding devices and an inherently resilient sheet holding finger inclined in the direction of travel of the sheets and having an abrupt, rigid end in contact with the face of the sheet stack adjacent to the end of the path of travel of the combing device.

23. A sheet separator including in combination a traveling combing device, a support arranged to the rear of said combing device, a plurality of sheet holding fingers mounted on said support and extending forward at each side of the combing device and having abrupt, rigid contact parts contacting with the face of the stack.

24. A sheet separator including in combination a traveling combing device, a support arranged to the rear of said combing device, a plurality of inherently resilient sheet-holding fingers mounted on said support and extending forward at each side of the combing device, said fingers each having an abrupt, rigid end contacting with the face of the stack.

25. A sheet separator including in combination a traveling combing device, a support arranged to the rear of said combing device, a plurality of inherently resilient sheet-holding fingers mounted on said support and extending forward at each side of the combing device with their ends contacting with the face of the stack.

26. In a sheet separator, the combination with a spring finger extending over the face of the stack and having its end in contact with the face of the stack, of a rigid member attached to said spring finger, a pivotal support for said rigid member and means for moving said rigid member about its pivotal support to vary the pressure of said spring finger upon the sheet.

27. In a sheet separator, the combination with a spring finger extending over the face of the stack and having an abrupt, rigid end in contact with the face of the stack, of a rigid member attached to said spring finger, a pivotal support for said rigid member and means for moving said rigid member about its pivotal support to vary the pressure of said spring finger upon the sheet.

28. A sheet separating mechanism including in combination sheet supporting means, a plurality of combing devices, a plurality of feeding off devices, a plurality of holding devices having abrupt, rigid contact portions acting on the rear ends of the sheets, and means for regulating the pressure of such contact portions whereby they will hold a sheet against the action of the feeding off devices when acting through another sheet, but not against the combing devices and means for positioning said devices to act on sheets of different sizes.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

RUFUS A. FREEMAN.

Witnesses:
H. I. KLEINERT,
A. WANGLER.