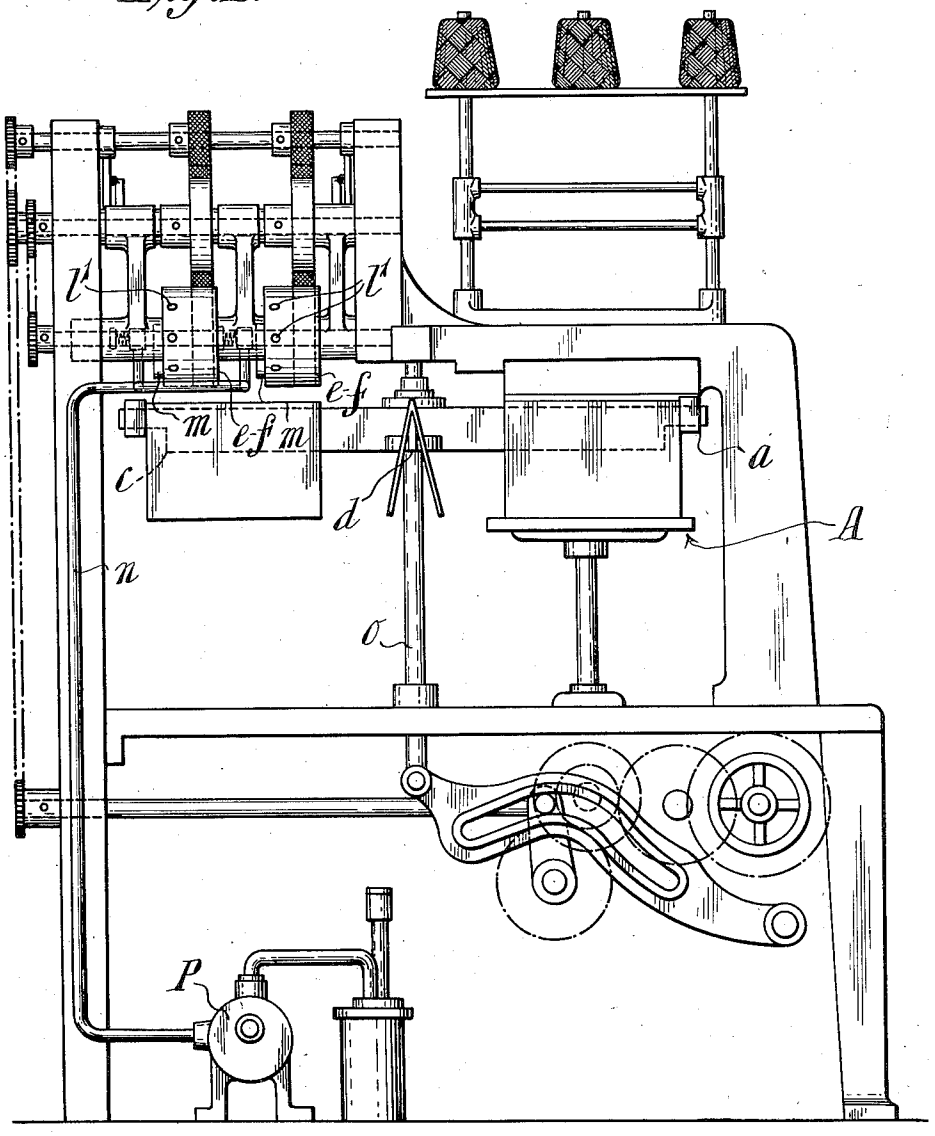
Nov. 5, 1935. O. KLEINSCHMIT ET AL 2,020,068

METHOD OF AND APPARATUS FOR FEEDING SIGNATURE HANDLING MACHINES

Filed Oct. 16, 1930 6 Sheets-Sheet 1

Fig. 1.



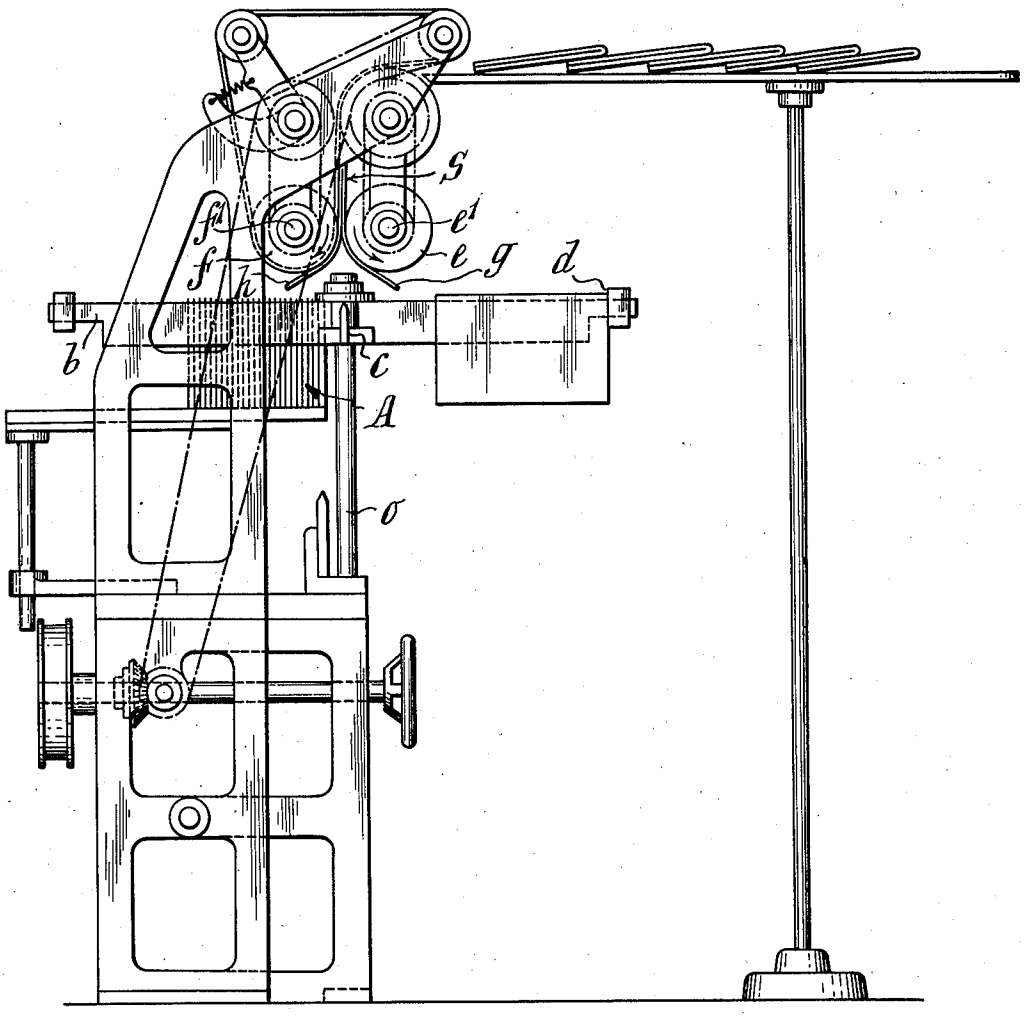
Inventors:
Oscar Kleinschmit
and Walter Geissler
By Lueder & Lueder
Attorneys.

Nov. 5, 1935. O. KLEINSCHMIT ET AL 2,020,068

METHOD OF AND APPARATUS FOR FEEDING SIGNATURE HANDLING MACHINES

Filed Oct. 16, 1930 6 Sheets-Sheet 2

Fig. 2.



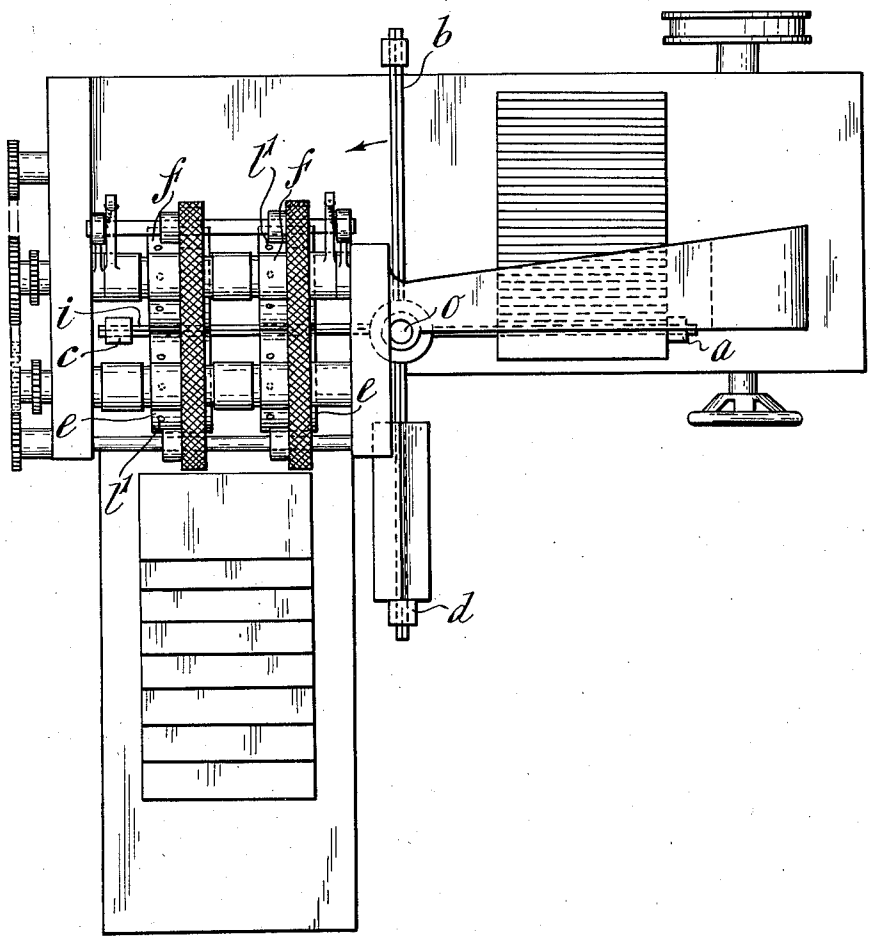
Inventors:
Oscar Kleinschmit
and Walter Geissler
By Lucius Parrish
Attorney

Nov. 5, 1935. O. KLEINSCHMIT ET AL 2,020,068

METHOD OF AND APPARATUS FOR FEEDING SIGNATURE HANDLING MACHINES

Filed Oct. 16, 1930 6 Sheets-Sheet 3

Fig. 3.



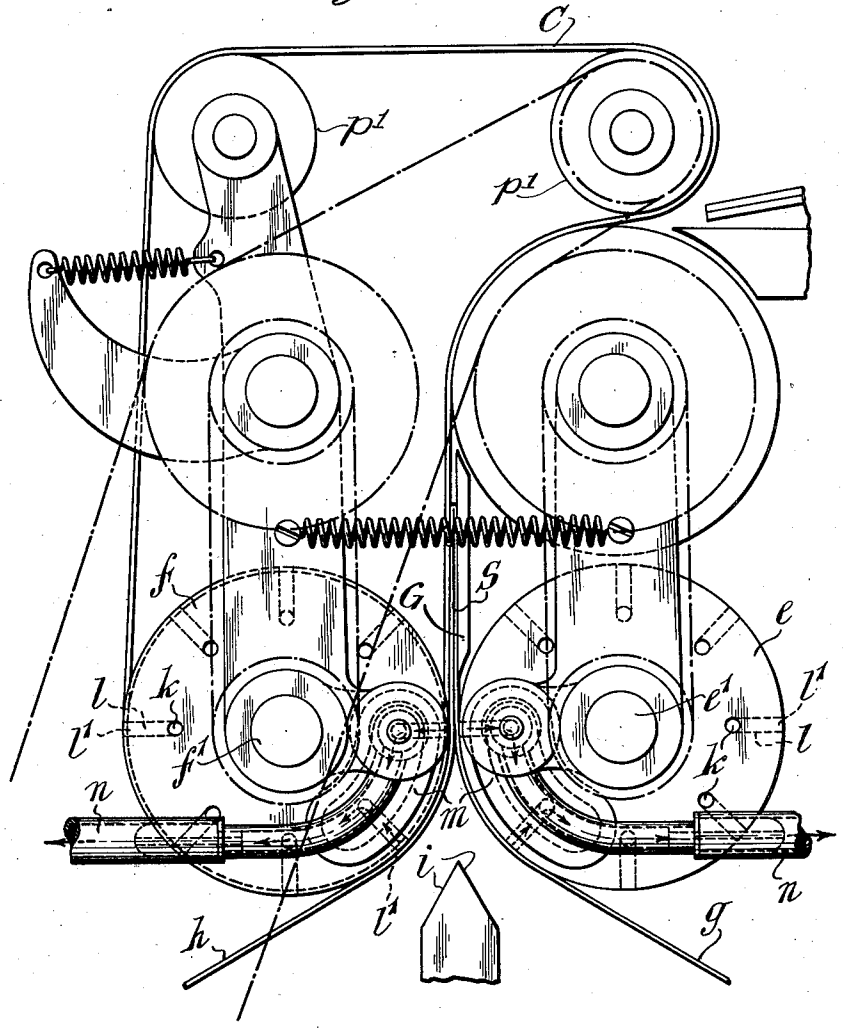
Inventors:
Oscar Kleinschmit
and Walter Geissler
By Lewis Ormsby & Co
Attorney.

Nov. 5, 1935. O. KLEINSCHMIT ET AL 2,020,068

METHOD OF AND APPARATUS FOR FEEDING SIGNATURE HANDLING MACHINES

Filed Oct. 16, 1930 6 Sheets-Sheet 4

Fig. 4.



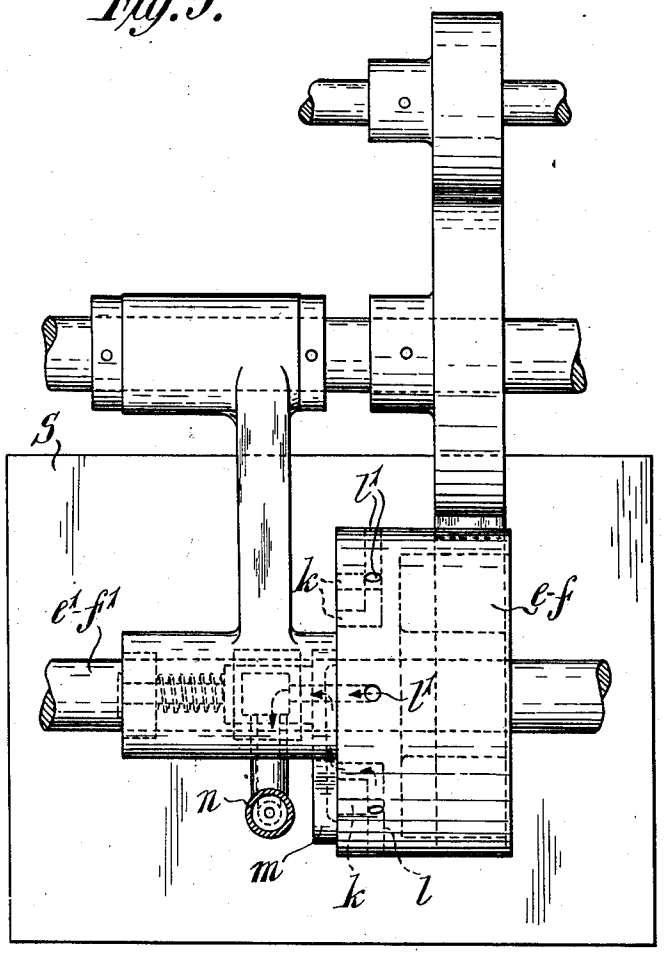
Inventors:
Oscar Kleinschmit
and Walter Geissler
By Lucius Quarles
Attorney

Nov. 5, 1935. O. KLEINSCHMIT ET AL 2,020,068

METHOD OF AND APPARATUS FOR FEEDING SIGNATURE HANDLING MACHINES

Filed Oct. 16, 1930 6 Sheets-Sheet 5

Fig. 5.



Inventors;
Oscar Kleinschmit
and Walter Geissler
By Lucius Ramsey Jr.
Attorney

Nov. 5, 1935. O. KLEINSCHMIT ET AL 2,020,068

METHOD OF AND APPARATUS FOR FEEDING SIGNATURE HANDLING MACHINES

Filed Oct. 16, 1930 6 Sheets-Sheet 6

Fig. 6.

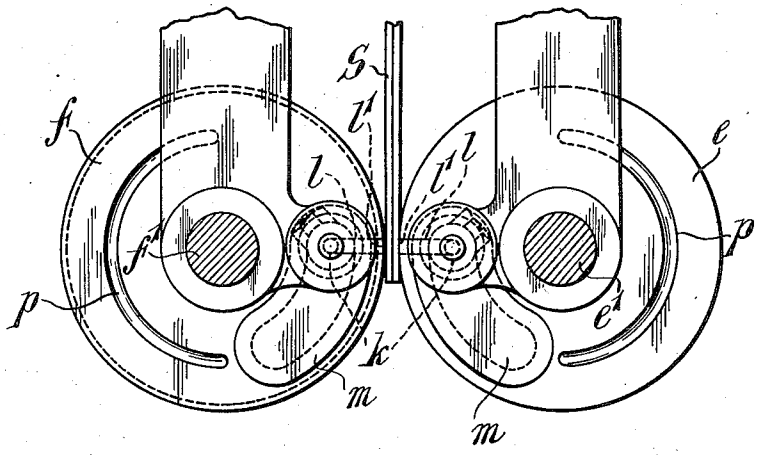
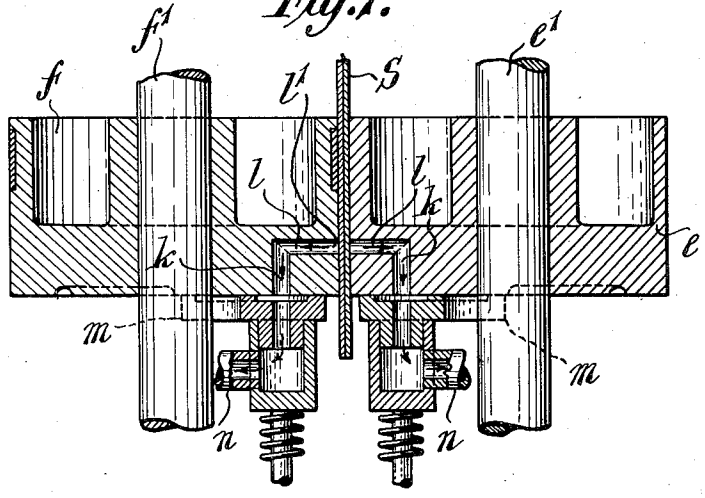


Fig. 7.



Inventors:
Oscar Kleinschmit
and Walter Geissler
By Lucius Tuttle
Attorney.

Patented Nov. 5, 1935 2,020,068

UNITED STATES PATENT OFFICE

2,020,068

METHOD OF AND APPARATUS FOR FEEDING SIGNATURE HANDLING MACHINES

Oscar Kleinschmit and Walter Geissler, Leipzig-Plagwitz, Germany, assignors to Gebruder Brehmer, Leipzig-Plagwitz, Germany, a German firm

Application October 16, 1930, Serial No. 489,220
In Germany May 15, 1930

20 Claims. (Cl. 270—54)

The present invention relates to the automatic feed of folded paper or like signatures to wire and thread-stitching machines, gathering machines and the like in which the individual signatures are placed straddlewise on a signature carrier or saddle for a further operation. To this end the closed signatures supplied to the machine must be opened.

The object of this invention is to provide means for automatically opening the closed signatures during the feeding of the latter to the machine, and to position them straddlewise upon a wing of the signature carrier of the stitching mechanism.

According to this invention the feed is effected in such a manner that a folded sheet in closed position is placed either by hand or automatically between two rolls operating periodically as suction rolls and is held thereon in the vicinity of the suction apertures of the rolls and then opened during the rotation of the latter so as to be positioned on a signature carrier or saddle which may be stationary or moving thereunder. As soon as the signature is opened the suction ceases and the opened leaves of the signature are released from the rolls which, however, continue to rotate, thereby positioning the opened out signature on the signature carrier or saddle situated beneath them at this moment, whereafter the saddle conveys the signature to the stitching means.

In a constructional example this is illustrated in connection with a book thread-stitching machine in which the signatures are placed on saddle shaped arms of a spider and, by the appropriate rotation and elevation of the spider, are then brought beneath the stitching means.

Fig. 1 is a front elevational view of a book thread stitching machine.

Fig. 2 is a side elevation thereof.

Fig. 3 is a plan view of the machine.

Fig. 4 a detail view of the feed and suction rolls drawn to a larger scale.

Fig. 5 is a side elevational view of the mechanism shown in Fig. 4, and

Figs. 6 and 7 are details of a modified arrange- of the suction rolls.

Referring to Figs. 1, 2 and 3, A designates an appropriate stitching machine which, in the instance shown is a quadruple-wing thread-stitching machine of a known type having four saddle wings *a*, *b*, *c* and *d* which rotate about the vertical axis *o*. The wing *a* is shown in the stitching position below the needles while the wing *c* is positioned on the opposite side of the axis *o* in direct line with the wing *a*. Arranged above the wing *c* is the signature feed device comprising two pairs of inversely rotating rolls *e*, *f* mounted upon shafts *e'*, *f'*. Periodical suction is produced on the circumferential faces of these rolls, by any suitable suction device which is placed in communication with appropriate apertures on the circumferential faces of the rolls so that during the passage of a signature between the rolls *e*, *f* both of the leaves or sections *g*, *h* of the signature S (Fig. 2) are drawn to the periphery of the rolls and held thereto. By the continued rotation of the rolls *e*, *f* the leaves *g*, *h* of the signature are carried in opposite directions and the signature thus caused to be opened so that its two leaves *g* and *h* are positioned respectively to the right and left above a saddle *i* on the wing *c* so that when the vacuum is destroyed the leaves *g* and *h* are released and the signature is free to drop straddlewise on the saddle *i*.

In the constructional form shown (see particularly Figs. 4 and 5), the vacuum or suction control is effected in the following manner. One lateral face of each of the rolls *e*, *f* (which latter might be replaced by individual inversely running discs) is provided somewhat close to its circumferential edge with a number of apertures *k* which communicate with the ducts *l*. The latter lead to the circumferential face of the roll to form apertures *l'*. Arcuate valve plates *m* forming part of air suction control devices are mounted on the shafts *e'*, *f'* and adapted to be held in spring pressed contact with the lateral faces of the rolls *e*, *f* in the path of the apertures *k*. The valve plates are connected to an appropriate suction pump P by means of suction duct conduits *n*. The valve plates *m* each extend around some part of the circumference of the lateral faces of the respective rolls engaged thereby so that, during the rotation of the rolls the suction period of any aperture *l'* covered by the signature is maintained as long as the intercommunicating aperture *k* is within the area of the valve *m*. A vacuum is thus created within the registering suction aperture *l'* so causing the covering signature-leaf to adhere to the roll. When the corresponding aperture *k* passes from beneath the valve plate the vacuum in the aperture *l* is destroyed and the signature released. By lengthening or shortening the valve plate or arranging the latter to be adjustable in the vertical plane, the suction period may therefore be regulated.

The rolls *e* and *f* may at the same time serve

as conveyor rolls and may be journalled elastically either both or one of them relatively to the other. If desired special feed rolls may, however, be provided. In this construction the arrangement of these special feed rolls is in the following manner:

An endless conveyor band C (Figs. 1, 2 and 4) is passed around the suction roll *f* and suitable guiding pulleys P', and in association with the vertical guide plate G serves to convey the closed signatures to the suction rolls *e*, *f*. In operation the incoming signature fed from the lay table or pile by these conveying means is seized in the bite of the rolls *e'*, *f'* and, simultaneously, suction is created in those apertures *l'* registering against the leaves of the signature, by reason of the corresponding aperture *k* having passed beneath the valve plates *m* and therefore come into communication with the suction pump. The leaves *g*, *h* are thus held against the apertures *l'* until the vacuum is destroyed, that is to say, until the apertures *k* during the rotation of the rolls, are carried beyond the valve and so communicate with the atmosphere. As such valve plates function on both suction rolls, the signature is opened in its passage through the rolls *e*, *f* and, thereby, so held over the saddle *i* situated thereunder and upon which it is dropped or fed when the complete signature has been passed through the rolls by reason of the continued rotation of the latter. The signature, so deposited on the saddle, is then conveyed by the latter to the requisite stitching position beneath the needles.

By preference, the diameter of the suction rolls or discs *e*, *f* would be so chosen as to cause these rolls to perform only one revolution for each working cycle of the machine, i. e. for each complete signature handled. If smaller suction rolls are used the number of their revolutions can be varied in order to avoid the necessity of providing suction apertures over the whole circumference since these apertures establish the suction only in their passage past the valve plate. For example, with rollers of half the diameter and driven at twice the number of revolutions, the same sheet handling operation could be achieved. In this case only one aperture *l'* or transverse line of such apertures would be necessary (Figs. 6 and 7) but a groove or the like must then be provided to establish the connection of the valve plate with the atmosphere when the sheet is to be released from the roll and care must be taken to cause the suction apertures *k*, *l'* (or several of them side by side in order to increase the gripping area) to come into action at the moment when the fed-in signature has just entered the bite of the rolls.

In the first described air suction control arrangement vacuum is created in the valve *m* only when a passing sheet is covering the apertures *l'*, and the corresponding apertures *k* thereof are covered by the valve plate *m* that is to say, when a series of apertures *l'* are provided around the face of the roll, those that are not covered by the sheet when registering with the valve will provide air inlets or vacuum release for the valve. When, however, as in the alternative suction control arrangement, only one hole or line of holes *k*, *l* is provided, a groove *p* (Figs. 6 and 7) is necessary on the lateral side of each of the rolls. The groove *p* is arranged to connect with the valve plate and to form an air inlet thereto in order to destroy the vacuum created by the pump and so release the sheet and afford relief to the pump when the suction is not required, that is to say, when the signature has been opened and deposited straddlewise on the saddle for its further conveyance to the stitching means.

According to whether the valve plate extends more or less below the horizontal axis of the feed roll in the first described suction arrangement or in the second described suction arrangement according to the effective length of the groove *p* the signature is held by the rolls in its opened position for a longer or shorter period before being released. Any refinements necessary in the operation such as the holding and registering of the signature on the saddle and its retention thereon during conveyance may be effected in known manner.

The principle of automatically feeding and opening signatures as above described in order to place them straddlewise on a saddle support may be used also for gathering individual sheets into pamphlet form. In this case the movement of the saddle for conveying the gathered sheets must be so controlled in known manner as to take effect only after a definite or predetermined number of sheets has been placed successively on the saddle to form a pile thereon. Here again the paper supply may be effected either by hand or automatically. In the latter case by interposing an appropriate folding machine for the production, for instance, of business books in connection with which the sheets are mostly individually folded and then connected, the feed to the suction rolls may take place direct from the fold rolls but a switch for suitably turning the sheets would then have to be employed.

In the above description of the invention and also in the appended claims the word "signature" has been used, for the purpose of brevity to indicate generally all the forms of folded sheets forming book sections or the like which it is possible to handle automatically by apparatus incorporating the present invention. That is to say, the word signature is intended to imply book sections or the like comprising parallel-folded sheets, and parallel-folded and cross-folded sheets and also similarly folded sheets provided with attached end sheets.

We claim:

1. In a signature-handling machine, in combination, a main frame, a signature carrier rotatably mounted in said main frame, at least one stitcher head, a lay table, feed mechanism arranged between said lay table and said signature carrier, rotary means for opening the signatures during their transit through said feed mechanism, and means for positioning said signatures beneath said stitcher head.

2. In a signature-handling machine, in combination, a main frame, saddle-shaped signature carriers rotatably mounted in said frame, a stitcher head, a lay table adjacent said frame, feed rolls above said conveyor tables, feed mechanism arranged between said lay table and said feed rolls, to feed a signature to the said feed rolls, means for applying a suction effect through said feed rolls to open out the sections of the signature during its transit to a signature carrier, and means for positioning said opened out signature beneath the stitcher head.

3. In a signature-handling machine, in combination, a main frame, a spider member rotatably mounted in said main frame, saddle-shaped signature carriers mounted on the arms of said spider member, a stitcher head, a lay table adjacent said frame, inversely rotating feed rolls

arranged between said lay table and said signature carriers, a conveyor band associated with said feed rolls, means for applying suction through said feed rolls to open out the folded signatures during their transit to said saddle-shaped tables, means for depositing said signature on one of said saddle-shaped signature carriers, and means for positioning said signatures beneath the stitcher head.

4. In a signature-handling machine, in combination, a main frame, a signature carrier rotatably mounted in said frame, feed mechanism, suction rolls arranged between said feed mechanism and said signature carrier, means for applying a suction effect through said rolls to open out the leaves of the signature, and means for obtaining said suction effect.

5. In a signature-handling machine, in combination, a main frame, a signature carrier rotatably mounted in said frame, a stitcher head, feed mechanism, inversely rotating suction rolls arranged between said feed mechanism and said table, stationary valve plates associated with said suction rolls, a suction pump connected to said valve plates, and means for periodically applying said suction for the purpose described.

6. Apparatus for feeding signatures to a signature-handling machine, comprising a rotary signature carrier, inversely rotating suction rolls associated with said conveyor table, means for feeding a signature to said suction rolls, and air suction devices associated with said rolls whereby the latter are caused automatically to seize, open and release the signature fed thereto.

7. A signature opening device for use in a signature-handling machine, comprising inversely rotatable rolls each provided with an opening in its circumferential face communicating with an opening in a lateral face thereof, said lateral face also having a suction relief groove formed therein, a suction device, and stationary valve plates connected to said suction device and associated one with each roll and adapted to register with the lateral openings, whereby vacuum is automatically created and destroyed in said circumferential opening.

8. A signature opening device for use in a signature-handling machine, comprising a co-operative pair of inversely rotatable rolls each provided with a suction orifice in its circumferential face and a communicating orifice in a lateral face thereof, said lateral face also being provided with an independent air relief groove, stationary valve plates associated one with each roll and adapted to register alternately with the lateral openings of said rolls and said relief groove, a suction device connected to said valve plates, and means for conveying to said inversely rotating rolls a closed signature, the outer leaves of which are drawn by the registering circumferential suction orifices against the circumferential faces of said rolls and held thereon until the suction relief grooves register with said valve plates, whereupon said signature is released.

9. A signature-opening device comprising a co-operative pair of inversely rotatable rolls each provided with one or more suction orifices on its circumferential face and an opening in one lateral face thereof communicating with said circumferential opening, said lateral faces also being provided with an air relief groove, suction valve plates associated with said lateral faces and adapted to register alternately with said lateral openings and said air relief grooves, and a suction device connected to said valve plates.

10. Apparatus for opening book signatures comprising, in combination, a multiple arm rotary signature carrier, inversely rotatable suction rolls associated with said carrier, conveyor belts adapted to convey a closed signature to said rolls, means for driving said conveyor belts, and means for causing said suction rolls intermittently to seize and release said signature passing between the rolls.

11. A signature-opening device for use in a signature-handling machine, comprising a co-operative pair of inversely rotatable rolls at least one of said rolls being provided with a suction orifice in its circumferential face and a communicating orifice in a lateral face thereof, said lateral face also being provided with an independent air relief groove, a stationary valve plate associated with each roll thus provided with suction orifices and adapted to register alternately with the lateral openings of said rolls and said relief groove, a suction device connected to said valve plate or plates, and means for feeding to said inversely rotating rolls a closed signature the outer leaves of which are drawn by the registering circumferential suction orifices against the circumferential face of the corresponding roll and held thereon until the suction relief grooves register with said valve plate or plates whereupon said signature is released.

12. A signature-opening device comprising a co-operative pair of inversely rotatable rolls at least one of said rolls being provided with one or more suction orifices on its circumferential face and an opening in one lateral face thereof communicating with said circumferential opening, said lateral face or each of said faces being provided also with an air relief groove, a suction valve plate associated with said lateral face or each of said faces and adapted to register alternately with said lateral openings and said air relief grooves, and a suction device connected to said valve plate or plates.

13. Means for feeding and opening folded sheets or signatures comprising, in combination, a multiple arm rotary signature carrier, a work-engaging plate, at least one pair of inversely rotating suction rolls, conveyor belt pulleys aligned with said suction rolls, conveyor belts passing around one of each pair of said rolls and said pulleys and having stretches juxtaposed with said plate so as to engage and convey the closed signature to said suction rolls, and means for causing said rolls automatically to seize and release said signature as it passes between the rolls.

14. In a signature-handling machine, in combination, a main frame, saddle-shaped conveyor tables pivotally mounted in said frame, at least one stitcher head set above the path of said conveyor tables, rotary feed rolls set above the path of said tables so as to deposit signatures thereon, means for conveying closed signatures to said feed rolls, means for applying suction to each signature through at least one of said feed rolls so that the signature is opened and deposited straddlewise upon said conveyor tables, and means for positioning said opened signatures beneath said stitcher head.

15. In a signature-handling machine, in combination, a main frame, a conveyor table pivotally mounted in said frame, at least one stitcher head mounted above the path of said conveyor table, a work lay table, work feed mechanism arranged between said lay table and said conveyor table, rotary means for opening the signatures during their transit through said feed mecha-

nism so that they are deposited straddlewise upon said conveyor table, and means for positioning said opened signatures beneath said stitcher head.

16. In a signature-handling machine, in combination, a main frame, at least one conveyor table pivotally mounted in said frame, work-feed mechanism, work-opening rolls arranged between said feed mechanism and said table, means for applying suction through at least one of said rolls to seize and open the leaves of said signatures, and means for controlling said suction so that said signatures when opened are deposited straddlewise upon said table.

17. In a signature-handling machine, in combination, a main frame, at least one conveyor table pivotally mounted in said frame, work-feed mechanism, at least one pair of inversely rotating feed rolls arranged between said table and said feed mechanism, means for applying suction to at least one of each pair of rolls to seize and open the leaves of said signatures, and means for controlling said suction so that said signatures when opened are deposited straddlewise upon said table.

18. In a signature-handling machine, in combination, a main frame, at least one conveyor table pivotally mounted in said frame, work-feed mechanism, work-opening members arranged between said feed mechanism and said saddle and comprising at least one pair of inversely rotating rolls, at least one of said rolls being provided with at least one suction orifice on its circumferential face and at least one opening on one lateral face thereof communicating with said suction orifice, a segmental suction valve plate arranged to engage said lateral face of said roll periodically to cover said opening, and a suction device connected to said valve plate.

19. In a signature-handling machine, in combination, a main frame, a conveyor table pivotally mounted in said main frame, a lay table, signature opening members between said lay table and said conveyor table, a work engaging plate between said lay table and said signature-opening members, a conveyor belt having a stretch thereof juxtaposed with said plate to feed closed signatures to said signature-opening members, and means for applying suction to at least one of said signature-opening members to effect the opening of the signatures.

20. In a signature-handling machine, in combination, a main frame, a conveyor table pivotally mounted in said frame, a lay table, at least one pair of inversely rotatable apertured rolls between said lay table and said conveyor table, conveyor belt pulleys aligned with one of each pair of said rolls, a conveyor belt passing around said pulleys and associated roll, a work engaging plate juxtaposed with a stretch of each belt so that the closed signatures are engaged therebetween and carried by said belt to said rolls, a segmental valve plate associated with at least one of said rolls to apply suction thereto, and a source of suction applied to each valve plate.

OSCAR KLEINSCHMIT.
WALTER GEISSLER.