

March 19, 1935.

O. KLEINSCHMIT ET AL

1,994,613

SHEET HANDLING DEVICE IN BOOK STITCHING MACHINES

Filed Jan. 26, 1932

5 Sheets-Sheet 2

Fig. 2.

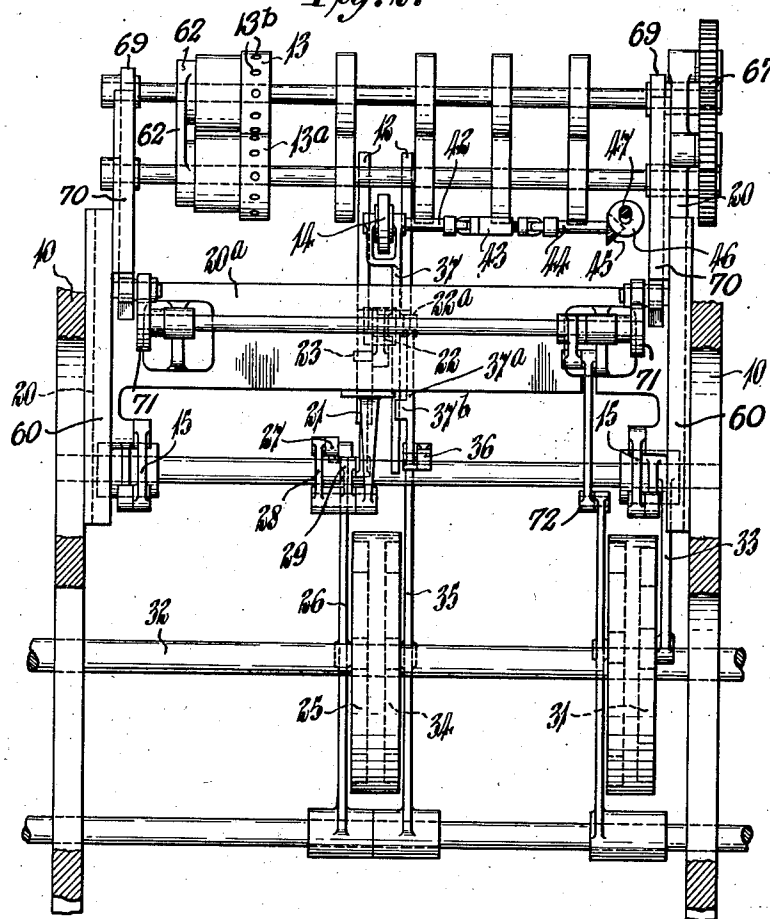
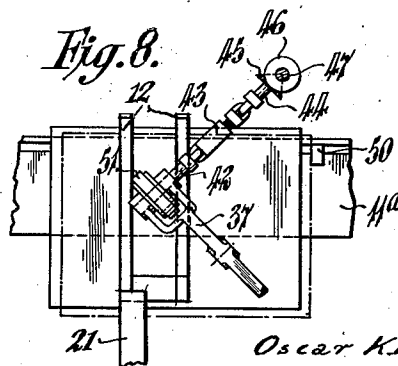


Fig. 8.



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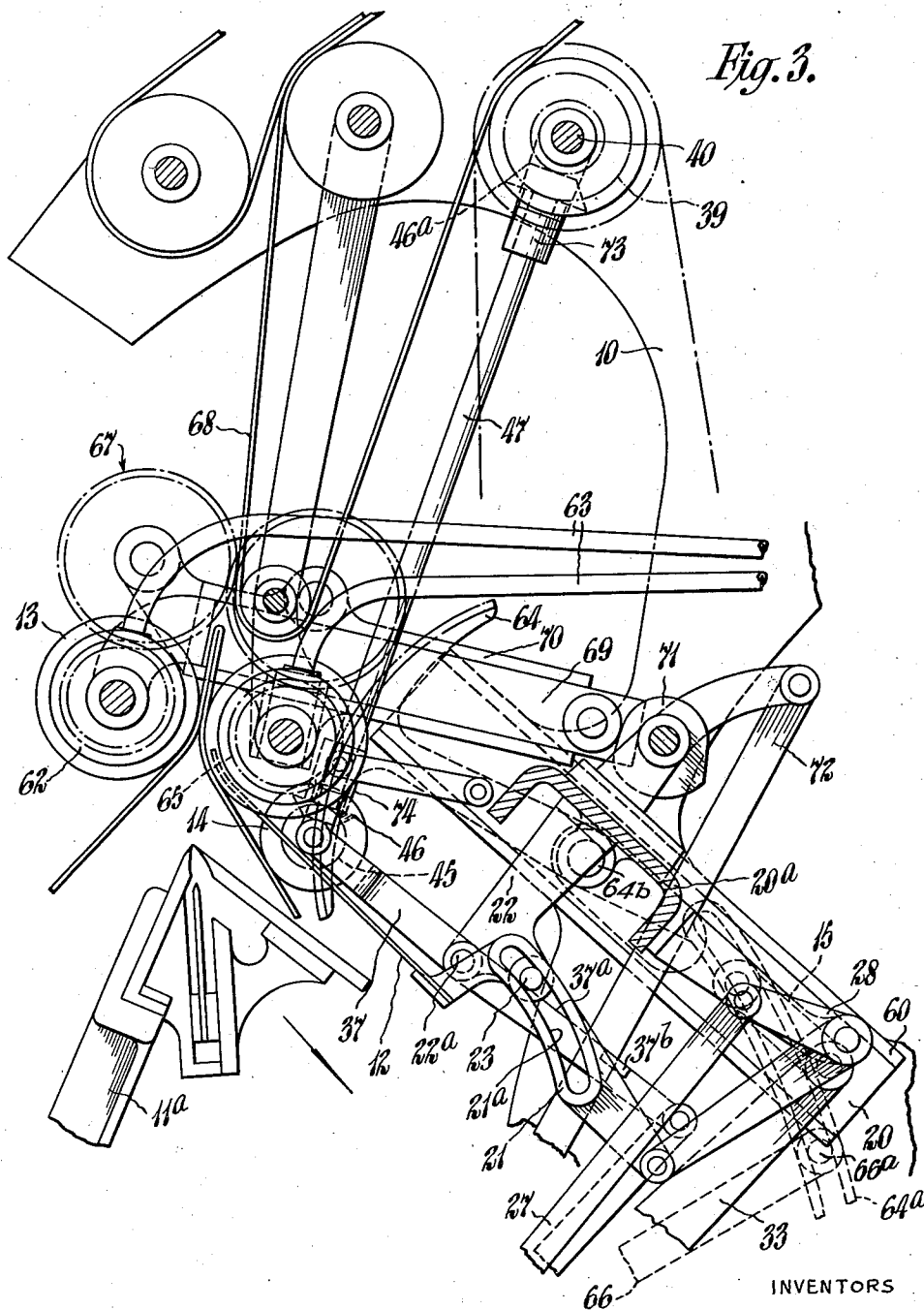
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5 Sheets-Sheet. 3



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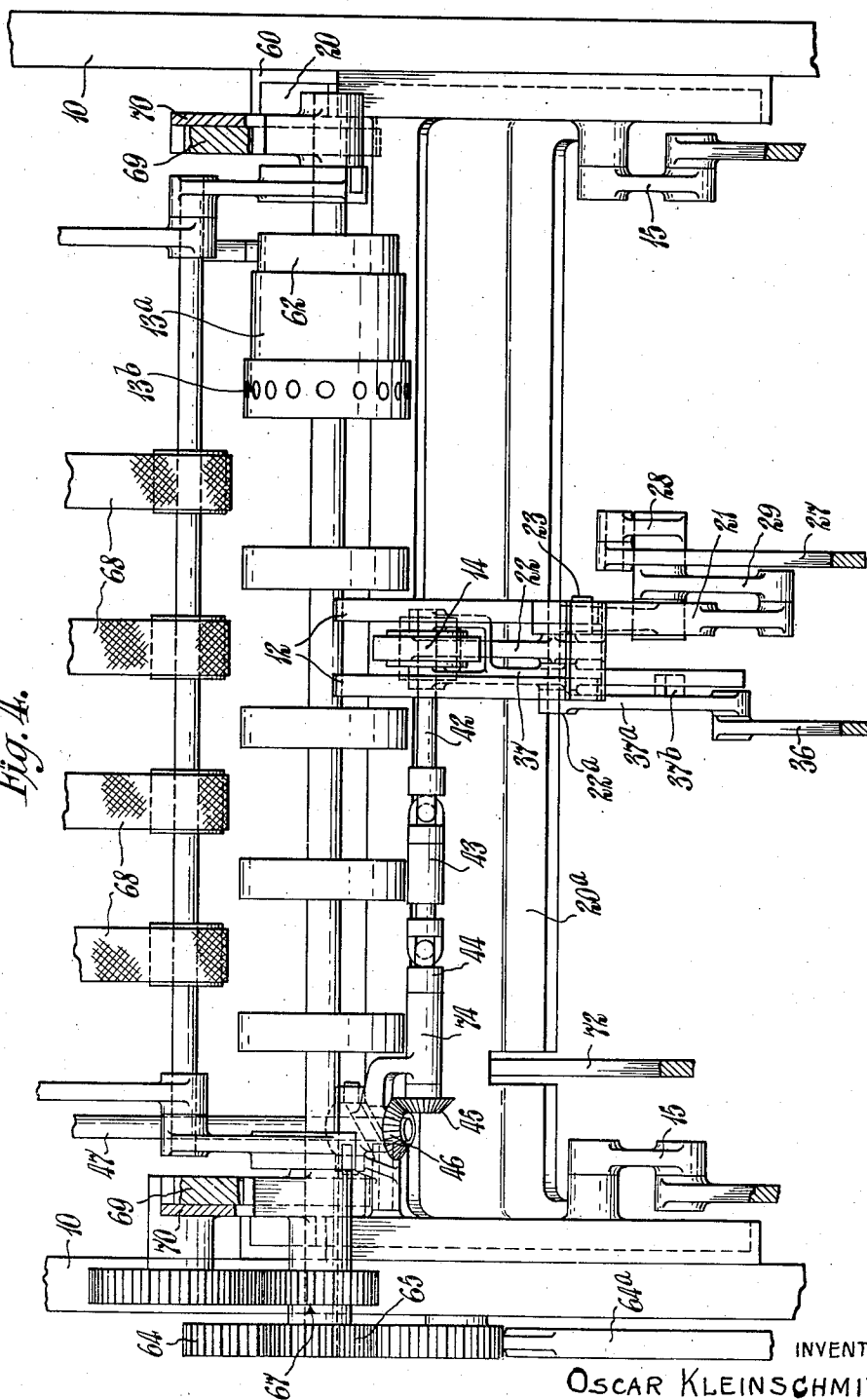
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5 Sheets-Sheet 4

Fig. 4.



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5 Sheets-Sheet 5

Fig. 5.

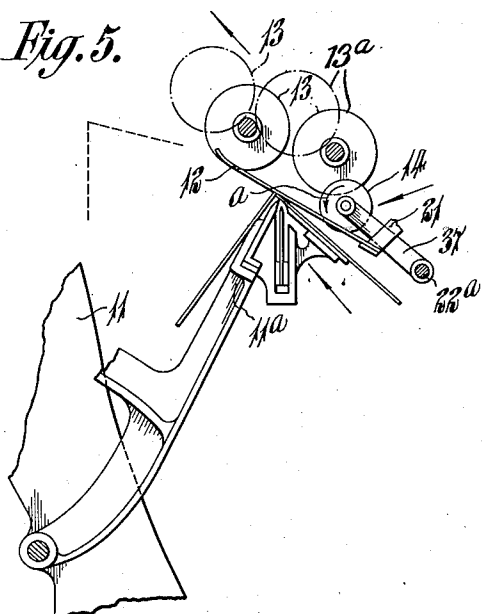


Fig. 6.

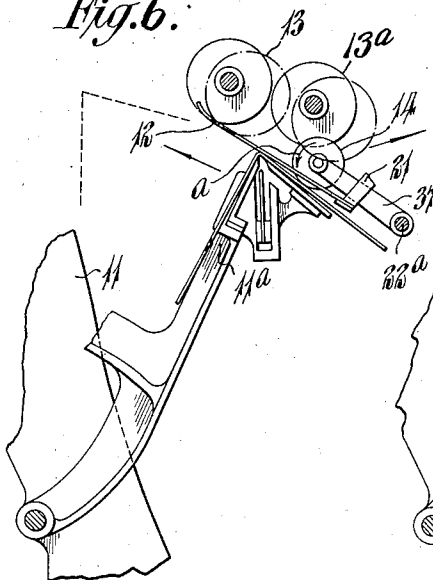
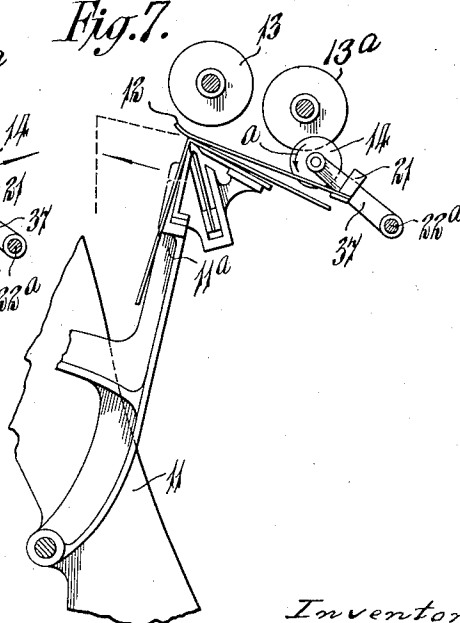


Fig. 7.



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UNITED STATES PATENT OFFICE

1,994,613

SHEET-HANDLING DEVICE IN BOOK-STITCHING MACHINES

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Application January 26, 1932, Serial No. 589,012
In Germany February 11, 1931

28 Claims. (Cl. 112—21)

The present invention relates to book-stitching machines and is more particularly concerned with the provision of means for retaining, pressing and registering sheets or book-sections upon the saddle conveyor of a book-stitching machine of the swinging sheet-carrier type.

When sheets are fed manually to a stitching machine of the above type during the operation thereof, the said sheets are pressed upon the saddle of the sheet carrier by the hand of the operator and so held thereon until they are conveyed to beneath the stitching means. When mechanical sheet feeding means are utilized, it is not possible to retain and register the sheets upon the sheet carrier in this manner.

According to the present invention means are provided for mechanically pressing, registering and retaining upon the swinging sheet-carrier of a book-stitching machine, a folded sheet or the like placed straddlewise thereon.

This invention may be carried into effect by mechanism whereby suitable blade springs or similar members are caused to bear upon the fold of the sheet carried by the sheet-carrier, the blade springs being adapted, in addition to making a downward movement for the purpose of effecting the detaining pressure upon the sheet, to perform a traveling or smoothing movement over some part of the sheet in order to force the fold of the sheet into the effective stitching position and also to retain it against displacement from this position. The springs may be aided in effecting the registration of the sheet by a preferably rubber-faced roller which is caused to rotate intermittently or continually as desired. After the sheet is placed upon the sheet-carrier and the spring members caused to contact with the fold thereof, the roller is engaged with one lateral surface of the said sheet, and by reason of its rotation, pulls the fold of the sheet firmly against the apex of the sheet-carrier. The roller may be positioned so that the plane of its rotation is at an oblique angle to the edge of the sheet. By so positioning the roller, it is caused to exert upon the sheet a laterally acting force in addition to the downwardly acting force above described. The sheet may thus be drawn against a suitably positioned lateral stop and so properly registered upon the sheet-carrier prior to the stitching operation.

In order that the invention may be more clearly understood, one constructional embodiment thereof will now be described in reference to the accompanying drawings in which:

Fig. 1 is a part sectional side elevational view

of an automatic sheet feeding unit constructed according to this invention and shown associated with a book-stitching machine of the swinging sheet carrier type but with certain operative parts removed for clearness.

Fig. 2 is a plan view of the sheet-feeding unit.

Fig. 3 is an enlarged side elevational view of part of Fig. 1.

Fig. 4 is a vertical view taken on the line IV—IV of Fig. 1 also to an enlarged scale.

Figs. 5, 6 and 7 are detail views of various operative positions of the sheet retaining device, and

Fig. 8 is a diagrammatic view showing an alternative arrangement of the sheet-registering roll.

Referring to Figs. 1 and 2, the sheet-feeding unit includes a frame 10 positioned adjacent the swinging sheet-carrier 11a the latter forming part of a book stitching machine 11 of known type. Inversely rotating sheet-opening rolls 13, 13a are arranged over the path of travel of the sheet-carrier 11a and are suitably supported by slide members 20 carried in guides 60 fixed to or forming part of the main frame 10.

The slide members 20 are connected by a crosspiece 20a and movement is imparted thereto from a cam 31 mounted on a driven shaft 32 journaled in the main frame 10, by way of bell crank lever 33 pivoted to the frame 10, and link member 15. The shaft 32 is in driving connection with the drive shaft of the stitching machine 11 through the gear train 61, and the contour of the cam 31 is such that the slide members 20 and the sheet-opening rolls 13, 13a carried thereby are caused to move and register with the sheet-carrier 11a during all or part of its operative stroke.

The sheet-opening rolls 13, 13a are of the known suction-operated type wherein suction is applied to sheets passing therebetween by means of a series of ports 13b under the control of valve chests 62 from suitable flexible suction conduits 63 connected to any suitable pump or other source of suction.

In order to feed the sheets the rolls 13, 13a are rotated either continuously or in an oscillatory manner by means, as shown in Figs. 3 and 4, comprising an arcuate rack 64 pivotally journaled at 64b in one of the slide members 20 and engaging a pinion 65 fixed to the shaft supporting the roll 13a. The arcuate rack 64 to the further side of its pivot 64b is provided with a slotted extension 64a to which is adjustably connected at 66a one end of a link 66 arranged to

be operated by a suitable cam (not shown) fixed to the shaft 32, the extent of rotation of the suction rolls 13, 13a being adjustable and predetermined according to the size of the sheet to be handled by the appropriate positioning of the connection 66a of the link 66 in the slotted extension 64a of the rack 64 wherever the extent of angular movement of the rack 64 is varied as desired.

The roll 13 is driven by way of the gear train 67 from the roll 13a so as to rotate in an inverse direction to it and thus to open sheets fed therebetween by the conveyor bands 68, and in order to facilitate the entry and correct positioning of the sheets the roll 13 is carried by a slide member 69 supported in guides 70 fixed to or forming part of the slides 20 and is arranged to be separated from the roll 13a by means of cams 71, actuated by link mechanism 72 from a cam (not shown) carried by the shaft 32.

In this arrangement of the machine the sheet opening rolls are set to deposit the fold of each opening sheet above the apex of the swing sheet-carrier 11a and somewhat to the left thereof as viewed in Fig. 3.

The slide 20 also serves to support the sheet retaining member or members and the sheet registering device or devices all of which members therefore move with the sheet opening rolls during the operative movement of the latter.

The sheet-retaining members each comprise a bifurcated blade spring 12 preferably curved at its free extremity and secured to a curved arm 21 provided with an arcuate slot 21a. A supporting bracket 22 secured to the cross-piece 20a carries a guide pin 23 which engages in the arcuate slot 21a of the curved arm 21 for the purpose hereinafter described.

Auxiliary movement is imparted to the sheet retaining spring or springs 12 by a cam 25 mounted on the driven shaft 32 and engaged by a cam follower carried by a pivotal lever 26. The latter is connected by means of the rod 27 to a two-arm lever 28 the arm 29 of which is pivotally connected to an extension of the curved lever 21. Movement is thus imparted to the sheet-retaining spring 12 and the latter is guided in its movement by the guide pin 23.

The sheet registering device comprises a preferably rubber-faced pull roller 14 which is adapted to engage each sheet and register the fold thereof with the apex of the sheet carrier and is journaled in the bearing arms of a rocking lever 37 the latter being freely pivoted intermediate its length on a pivot 22a supported by the bracket 22. An auxiliary arm 37a, Fig. 2, also freely mounted on the pivot 22a is provided with a lug 37b which is adapted to engage the lever 37 and so control the balance of the latter which normally tends to allow the roller 14 to contact with the sheet straddled on the sheet carrier. Rocking motion is imparted to the arm 37a from a cam 34 mounted on the shaft 32 and engaging a cam follower carried by a pivotal lever 35, the latter being connected to the arm 37a by means of the rod 36 which is linked thereto.

Rotary movement is imparted to the roller 14 in the following manner. A shaft 40, journaled in the machine frame 10 and driven from the shaft 32 by means of a belt drive 40a, carries a bevel gear wheel 39. The pivot upon which the roller 14 is journaled comprises a stub shaft 42 linked by means of a universal joint 43 to a similar stub shaft 44 which carries a bevel gear 45.

The latter is placed in driving connection with the bevel gear 39 by means of the interengaging bevel gears 46, 46a mounted on the connecting shaft 47. The interconnecting drive above described is arranged to be freely movable in accordance with the movement imparted to the slide member 20 and the intermeshing bevel gears are held in engagement by suitable bearing brackets 73, 74 associated with the upper and lower ends of the shaft 47, respectively.

The operation of the sheet feeding device is as follows:

A closed, folded sheet to be deposited straddlewise on the swinging sheet carrier 11a is fed to the sheet opening rolls 13 by conveyor bands 68 and is opened as shown in Figs. 1, 2, 3 and 4 by reason of the rotation imparted to the rolls 13, 13a by the arcuate effect in certain of the ports 13b thus causing the leaves of the sheet to split apart. During the subsequent associated movement of the swinging sheet carrier 11a and the rolls 13 the opened sheet is deposited upon the saddle of the sheet-carrier with its fold slightly to one side of the apex of the saddle as above described and shown in Fig. 3.

Auxiliary movement is imparted to the sheet-retaining member 12 as above described and, guided by the pin 23, the member 12 assumes at this point of the operation the position shown in Fig. 3.

In this position the sheet-retaining spring comprising the member 12 presses on the sheet in the proximity of its fold and holds it firmly but yieldingly upon the apex of the sheet carrier.

At this moment the pull roller 14, controlled by the lever 37a from the cam 34 as above described, is permitted to descend until the friction surface thereof engages with slight pressure against the corresponding side of the sheet-carrier the adjacent surface of the straddled sheet.

The direction of rotation of the roller 14 is as shown by the arrow *a* and thus the sheet engaged by the roller 14 is pulled downwards until the fold thereof rests snugly against the apex of the sheet carrier 11a as shown in Fig. 4. The fold, upon reaching the apex of the carrier saddle, is prevented by the retaining spring or springs 12 from lifting or travelling beyond the apex.

It will be appreciated that the sheet engaging and registering part of the operation takes place when the sheet-carrier is at the commencement of its forward or sheet feeding stroke which terminates beneath the stitcher heads of the stitching machine 11.

While the sheet registering or pull roller 14, after registering the sheet upon the carrier 11a, is caused by the continued rotation of the cam 34 to swing away from the sheet as shown in Fig. 5, the retaining springs 12 remain in the sheet-engaging position and move forward with the sheet-carrier 11a until the latter in completing its forward feeding stroke has moved upwards and forwards as indicated by the chain-dotted position of the carrier shown in Fig. 5. Thus, the auxiliary movement of the members 12 is enhanced somewhat in order to contact the springs with the sheet for the longest period practically possible during the feeding movement of the sheet-carrier 11a. In completing the forward feeding movement of the sheet-carrier the apex of the latter together with the fold of the sheet thereon slides from beneath the now stationary members 12 and thus finally ensures the

correct registration of the sheet fold with the apex of the said sheet carrier.

Referring to Fig. 8, an alternative arrangement of the sheet registering device is shown.

5 The saddle of the sheet-carrier 11a is provided with a preferably adjustable lateral stop 50 and the registering roller 51 is set obliquely to the longitudinal apical line of the carrier saddle.

When in engagement with a sheet carried by 10 the saddle it is obvious that the pull on the sheet exerted by the roller 51 will be in a direction also oblique to the apical line of the sheet-carrier so that the sheet will simultaneously be registered with one lateral edge thereof against the lateral stop 50 and its fold against the apex of 15 the sheet-carrier.

The position of the sheet-retaining springs in this embodiment of the invention may be as described in reference to the first embodiment or, 20 if desired, parallel to the sheet registering rollers 51.

In the above description the components comprising the sheet retaining, pressing and registering means have been referred to as single 25 members, but it will be understood that in practice a plurality of such members may be embodied in one machine for the purpose set forth.

The mechanism, by means of which the above invention may be carried into effect, is not necessarily confined to that above described, it being 30 obvious that many variations of such mechanism may be devised while remaining within the ambit of the invention as defined in the appended claims.

35 We claim:—

1. In a book-stitching machine of the swinging sheet-carrier type, a sheet retaining device, means for engaging said device with a folded sheet placed straddleside upon the sheet carrier, 40 a rotatable friction roll adapted to engage said sheet and means for rotating said roll whereby the fold of the sheet is drawn down upon the apex of the said sheet-carrier.

2. In a book-stitching machine of the swinging 45 sheet-carrier type, a sheet retaining device, means for engaging said device with a folded sheet placed straddleside upon the sheet carrier, a sheet stop provided on said carrier, a rotatable friction roll adapted to engage said sheet, 50 and means for actuating said friction roll whereby the fold of the sheet is drawn down onto the apex of the sheet carrier and the edge of the said sheet registered against the said sheet stop.

3. In a book-stitching machine, sheet handling 55 means comprising a saddle-shaped swinging sheet-carrier, a pivotally mounted rotatable friction roll adapted to engage said carrier or a folded sheet laid straddleside upon said carrier, means 60 for withholding the roll when desired from contact with the said carrier, means for rotating the said roll to draw the fold of the sheet down upon the apex of the said sheet-carrier, and means whereby the said roll is moved with the sheet-carrier during the operative movement of the latter 65 member.

4. In a book-stitching machine, sheet handling 70 means comprising a saddle-shaped swinging sheet-carrier, a lateral sheet stop provided on said sheet-carrier, a pivotally mounted rotatable friction roll set at an angle to the apical line of said sheet-carrier and adapted to engage a folded sheet placed straddleside thereon, and means for rotating said roll to draw the fold of the sheet 75 down upon the apex of the said sheet-carrier and

register one edge thereof with said lateral stop.

5. In a book-stitching machine, sheet-handling means comprising a saddle-shaped swinging sheet-carrier, a lateral sheet stop provided on said sheet-carrier, a pivotally mounted rotatable 5 friction roll set at an angle to the apical line of said sheet-carrier and adapted to engage a folded sheet placed straddleside upon said carrier, means for moving said friction roll with said sheet-carrier during the operative movement of the latter, 10 and means for rotating said friction roll whereby the said sheet is drawn down upon the apex of the said sheet-carrier and one edge of the said sheet registered against the said lateral stop.

6. In a book-stitching machine, in combination, 15 a saddle-shaped movable sheet-carrier, a sheet retaining device supported independently of said carrier, sheet opening and feeding means associated with said sheet-carrier and adapted to deposit a folded sheet thereon with the fold of said 20 sheet to one side of the apex of said carrier, means for registering said sheet fold upon the apex of said sheet-carrier, and means for actuating said sheet retaining device to engage the registered sheet during a part of the travel of the said sheet- 25 carrier.

7. In a book-stitching machine, in combination, a saddle-shaped movable sheet-carrier, a lateral sheet-stop provided on said carrier, a sheet 30 retaining device supported independently of said carrier, a sheet opening and feeding device associated with said carrier and adapted to deposit a folded sheet thereon with the fold of the sheet to one side of the apex of the said carrier, means 35 for registering said sheet with the apex of said carrier and said lateral stop, and means for actuating said sheet retaining device to engage said registered sheet during part of the travel of said carrier.

8. In a book-stitching machine, in combination, 40 a saddle-shaped swinging sheet-carrier, means for depositing a folded sheet straddleside upon said carrier, sheet retaining members associated with said sheet-carrier, means for engaging said sheet retaining members with the fold 45 of a sheet placed on the sheet-carrier, a sheet registering friction roll associated with said sheet retaining members, means for engaging said roll with the said sheet, means for rotating said roll to draw the fold of the sheet down upon the apex 50 of said sheet-carrier and means for timing the actuation of the said sheet-handling means in accordance with the normal operation of the said stitching machine.

9. In a book-stitching machine, in combination, 55 a saddle-shaped swinging sheet-carrier, means for opening a folded sheet and depositing same straddleside upon the said sheet-carrier, a movable sheet retaining blade spring associated with said sheet-carrier, means for supporting said 60 blade spring independently of said sheet-carrier, means for imparting movement to said blade spring relative to the movement of said sheet carrier, a pivotally mounted friction roll associated with said sheet carrier and adapted to engage 65 the sheet placed upon said carrier, means for controlling the contact of said roll with said sheet, means for imparting rotary movement to said roll to draw the fold of said sheet down upon the apex of said carrier, and means for imparting 70 an auxiliary movement to said blade spring whereby the fold of the said sheet is held down upon the apex of the sheet-carrier during the operative movement thereof.

10. In a book-stitching machine, in combination, 75

tion, a saddle-shaped swinging sheet-carrier, inversely rotating sheet opening and feeding rolls slidably mounted adjacent said sheet carrier and adapted to deposit a folded sheet straddlewise thereon, means for imparting linear movement to said feed rolls relative to the operative movement of the said sheet carrier, sheet retaining blade springs associated with said feed rolls and adapted to extend over the apex of the said sheet-carrier, means for imparting movement to the said blade springs relative to the operative movement of said sheet-carrier, at least one sheet registering friction roll adapted to engage the sheet placed upon said carrier, means for imparting movement to said roll relative to the operative movement of said sheet-carrier, means for rotating said roll to draw the fold of said sheet down upon the apex of said sheet-carrier and means for imparting auxiliary movement to said sheet-retaining blade springs whereby they are caused to engage and press upon the apex of the sheet-carrier the fold of the sheet registered thereon.

11. In a book-stitching machine, in combination, a saddle-shaped swinging sheet-carrier, a lateral sheet stop on said carrier, inversely rotating sheet opening and feeding rolls adapted to place a folded sheet straddlewise upon said sheet-carrier, means for imparting linear movement to said sheet-feeding rolls relative to the operative movement of said sheet-carrier, sheet retaining blade springs associated with said sheet-carrier and adapted to extend over the apex of said sheet-carrier, means whereby said springs are caused to move with said sheet-carrier during some part of the operative movement of the latter and held stationary during the completion of said operative movement, a sheet registering friction roll mounted at an angle to the apical line of the sheet-carrier and adapted to contact with the said sheet, means for rotating said roll whereby the said sheet is registered with the apex of said carrier and the lateral stop provided thereon, and means for timing mechanically the operative sequence of said sheet-handling mechanism.

12. In a book-stitching machine, a pivotal saddle-shaped sheet-carrier arranged to receive sheets straddlewise thereon, a sheet-retaining device adapted yieldingly to press a sheet upon said carrier, and a sheet-registering device arranged to engage the sheet to pull the fold of the sheet against the apex of said carrier.

13. In a book-stitching machine, a pivotal saddle-shaped sheet-carrier, automatic sheet-feeding means arranged to place folded sheets straddlewise upon said carrier, a sheet-retaining device, means for causing said device yieldingly to press the sheet upon said carrier, a sheet-registering device, and means for causing said sheet-registering device to engage the sheet thus to pull the fold thereof against the apex of said carrier.

14. In a book-stitching machine, the combination claimed in claim 13, including means for supporting said sheet-retaining device and said sheet-registering device independently of said sheet-carrier, and means for causing said supporting means to move in accordance with a part of the operative movement of said carrier.

15. In a book-stitching machine, a pivotal saddle-shaped sheet-carrier, automatic sheet-feeding and opening means arranged to place folded sheets straddlewise upon said carrier, a sheet-retaining device comprising a resilient sheet-engaging member, means for causing said device yieldingly to press the sheet upon said carrier, a sheet-registering device, and means for causing

said sheet-registering device to engage the sheet thus to pull the fold thereof against the apex of said carrier.

16. In a book-stitching machine, a pivotal sheet-carrier arranged to receive sheets straddlewise thereon, a sheet-retaining member adapted yieldingly to press a sheet upon said carrier, a sheet stop provided upon said carrier, a sheet-registering device arranged to engage the sheet both to pull the fold of the sheet against the apex of said carrier, and register an edge of the sheet against said sheet stop.

17. In a book-stitching machine, a pivotal sheet-carrier, automatic sheet-feeding means arranged to place folded sheets straddlewise upon said carrier, a sheet-retaining device and means for passing said device between said carrier and said sheet-feeding means to engage the sheet thus to hold it upon said carrier during part of the operative movement of said carrier.

18. In a book-stitching machine, a pivotal sheet-carrier, automatic sheet-feeding means arranged to place folded sheets straddlewise upon said carrier, a sheet-retaining device, means for causing said device to pass between said carrier and said sheet-feeding means, and means for causing said retaining device to engage the sheet to hold it upon said carrier during part of the operative movement of said carrier.

19. In a book-stitching machine, a pivotal sheet-carrier, automatic sheet-feeding and opening means arranged to place folded sheets straddlewise upon said carrier, a sheet-retaining device, and means for causing said device to perform a movement relative to the movement of said sheet-carrier, but independently thereof, so as to pass between said carrier and said sheet-feeding and opening means and press the sheet upon said carrier.

20. In a book-stitching machine, the combination claimed in claim 17, including means for moving said sheet-retaining device in accordance with the movement of said carrier.

21. In a book-stitching machine, a pivotal saddle-shaped sheet-carrier, automatic sheet-feeding means arranged to place folded sheets straddlewise upon said carrier, a sheet-retaining device, means for engaging said device with a sheet placed upon said carrier yieldingly to hold it in place thereon, a sheet-registering device, means for causing said sheet-registering device to engage the sheet and pull the fold thereof against the apex of said carrier, and means for causing said sheet-retaining device and said sheet-registering device to pass between said carrier and said automatic feeding means during the operative movement of the machine.

22. In a book-stitching machine, a pivotal saddle-shaped sheet-carrier, automatic sheet-feeding means arranged to place folded sheets straddlewise upon said carrier, a sheet-retaining device, a sheet-registering device, a sheet stop provided upon said carrier, means for causing said sheet-retaining device and said sheet-registering device to pass between said carrier and said sheet-feeding means, means for engaging said sheet-retaining device with a sheet placed upon said carrier to yieldingly hold it in position, and means for causing said sheet-registering device to engage the sheet both to pull the fold thereof against the apex of said saddle and register an edge of the sheet against said sheet stop.

23. A book-stitching machine, comprising in combination a pivotal sheet-carrier, a sheet-retaining device, and means for causing said device

to engage the sheet and perform a sliding movement relative to the carrier, and to the sheet carried thereon to force the sheet into effective stitching position and to retain the sheet against premature displacement.

24. A book-stitching machine, comprising in combination a pivotal sheet-carrier, automatic sheet-feeding and opening means arranged to place folded sheets straddlewise upon said carrier, a sheet-retaining device, means for engaging said device with a sheet placed upon said carrier, a sheet-registering device, means for engaging said device with the sheet placed upon said carrier, means for supporting said sheet-retaining means and said sheet-registering means independently of said carrier, and means for moving said supporting means in accordance with a part of the operative movement of said carrier.

25. A book-stitching machine, comprising in combination a pivotal sheet-carrier, automatic sheet-feeding and opening means, a sheet-retaining device, comprising at least one blade spring, means for causing said sheet-retaining device to pass between said carrier and said sheet-feeding and opening means, and means for engaging said sheet-retaining member with the fold of a folded sheet placed straddleswise upon said carrier by said automatic sheet-feeding and opening means.

26. In a book-stitching machine, a pivotal sheet-carrier arranged to receive a folded sheet

placed straddle-wise thereon, a sheet-retaining device, and means for actuating said device to engage the sheet and perform a sliding movement relative to the carrier and to said sheet carried thereon to force the sheet into effective stitching position upon said carrier and to retain the sheet against premature displacement.

27. In a book-stitching machine, a pivotal sheet-carrier arranged to receive a folded sheet placed straddle-wise thereon, a sheet-retaining device, means for actuating said device to engage the sheet and during such engagement to perform a movement relative to the carrier and to said sheet carried thereon, a sheet-registering device, and means for causing said sheet-registering device to engage said sheet to pull the fold of the sheet against the apex of said carrier.

28. In a book-stitching machine, a pivotal sheet-carrier saddle adapted to oscillate between the stitching station and the sheet-feeding station of the machine, a sheet-retaining device, means for moving said device over the apex of said moving carrier saddle to engage a sheet placed straddlewise upon said carrier, a sheet-registering device, and means for causing said sheet-registering device to engage said sheet to pull the fold thereof against the apex of said carrier.

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