

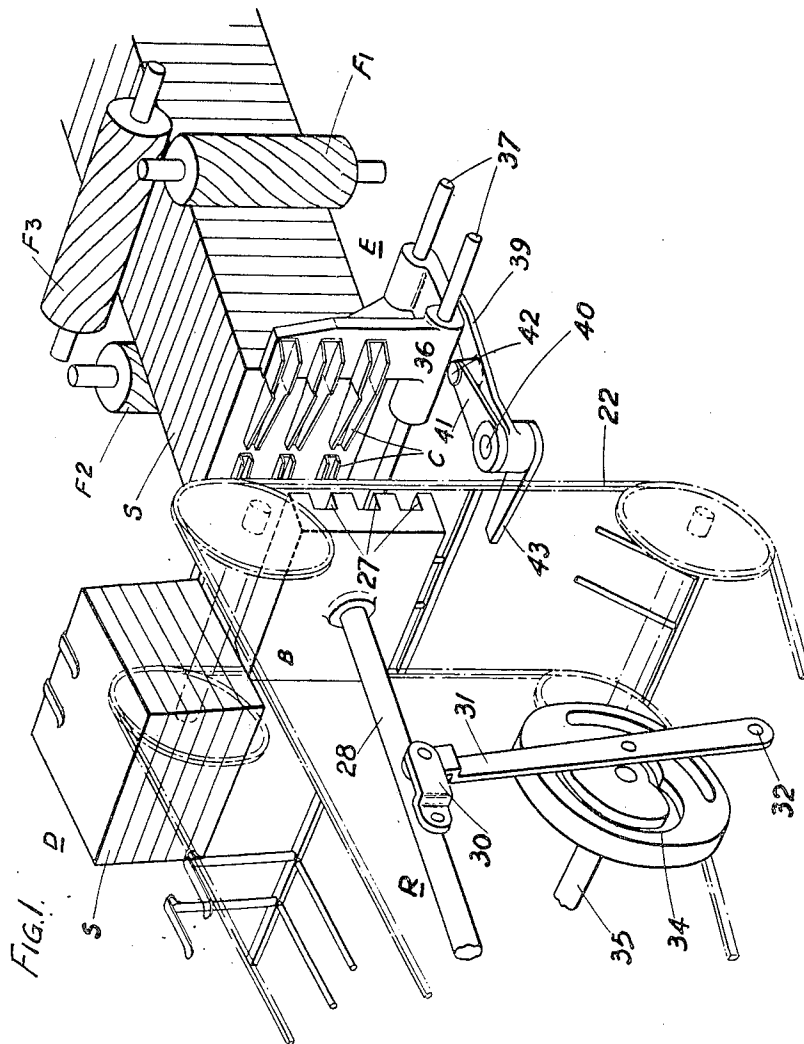
May 1, 1951

J. A. E. BURLS  
MACHINE FOR FINISHING THE PAGES TO BE DEALT  
WITH IN BOOKBINDING MACHINES

2,551,557

Filed Aug. 1, 1947

8 Sheets-Sheet 1



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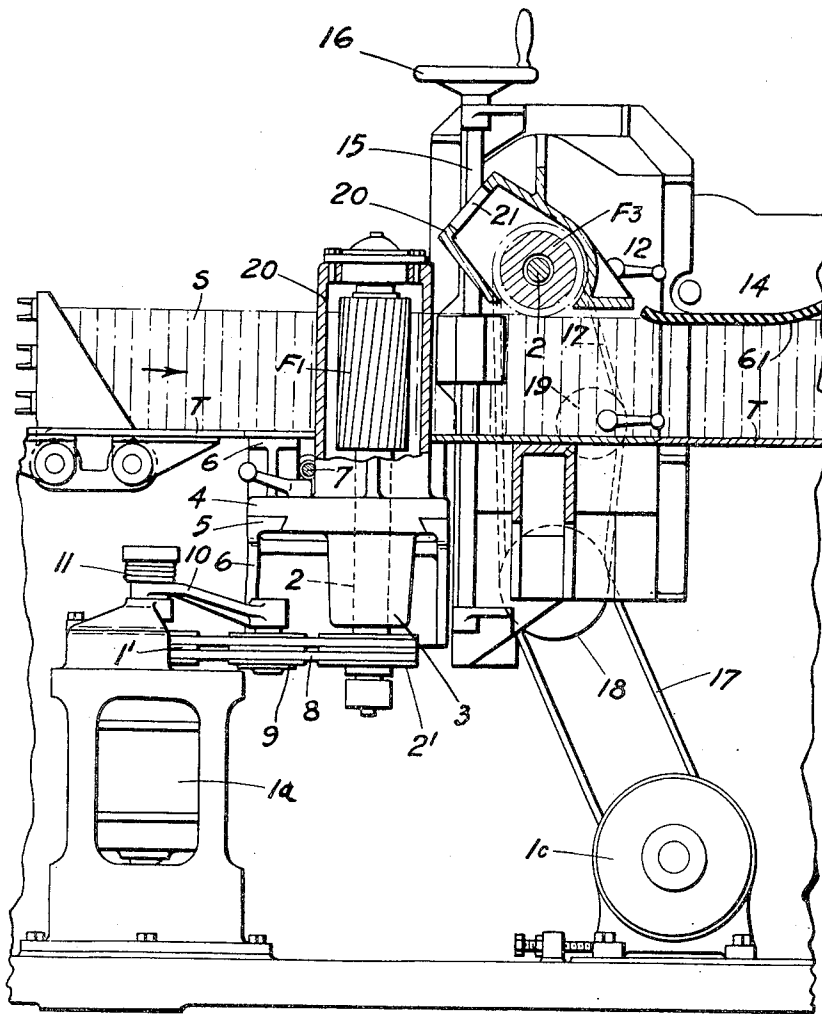
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8 Sheets-Sheet 2

FIG. 2.



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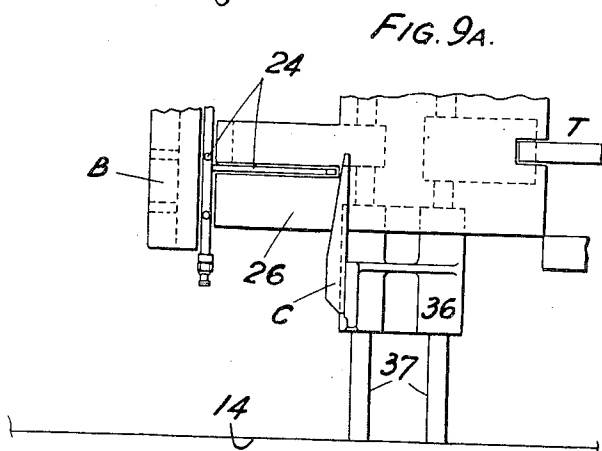
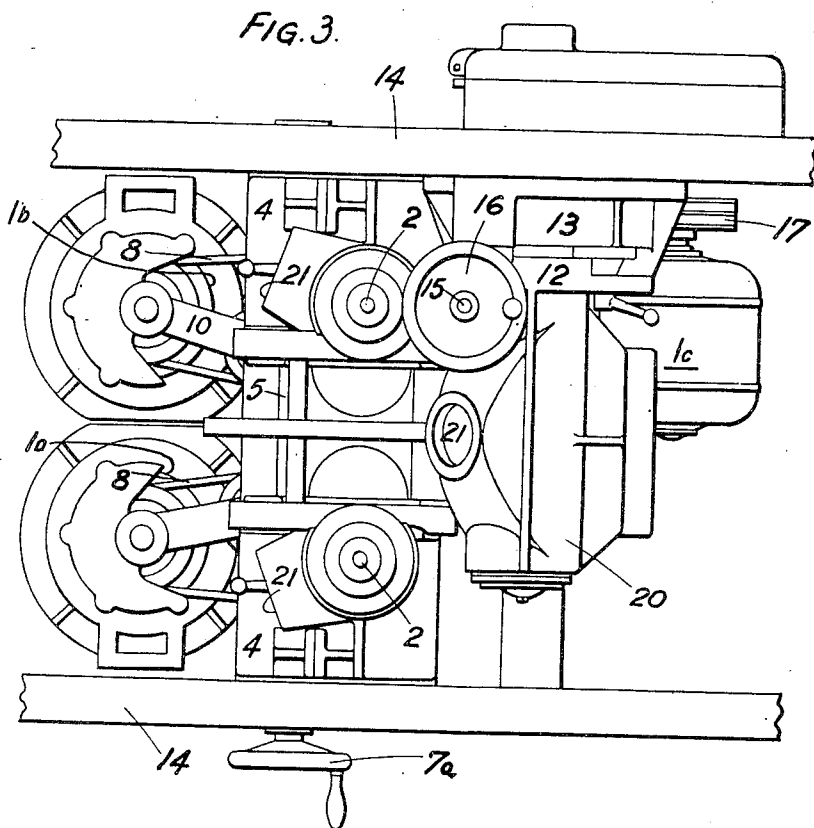
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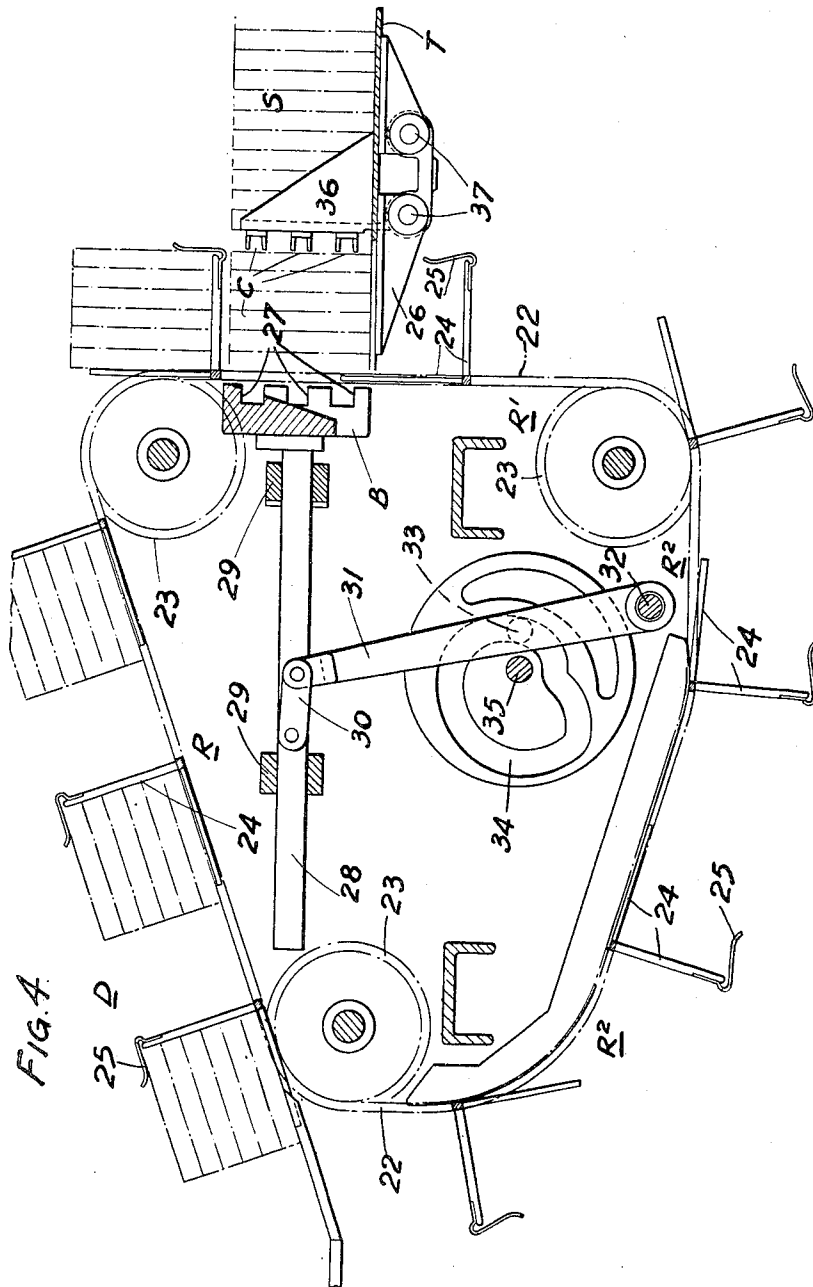


FIG. 4.

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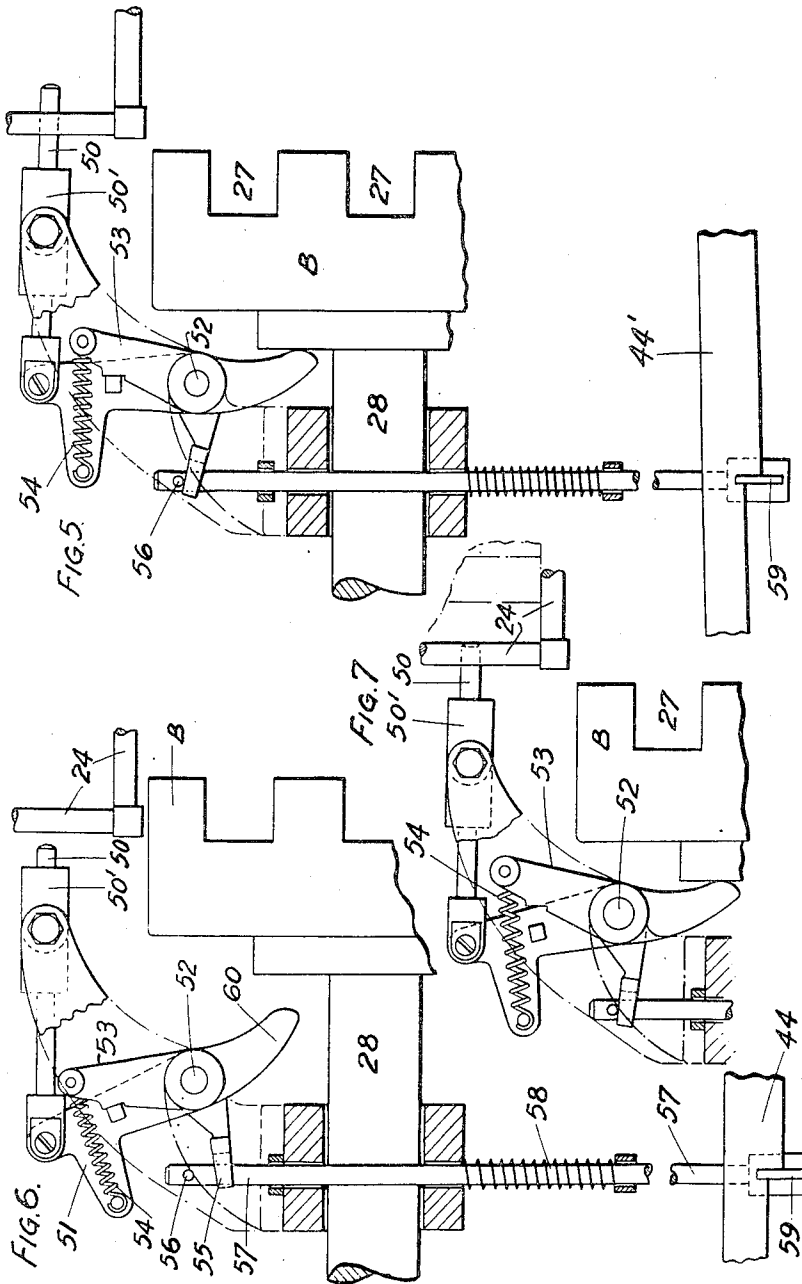
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8 Sheets—Sheet 5



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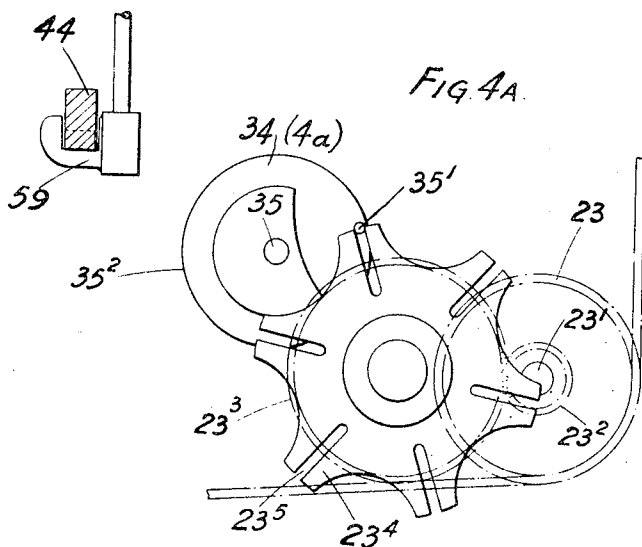
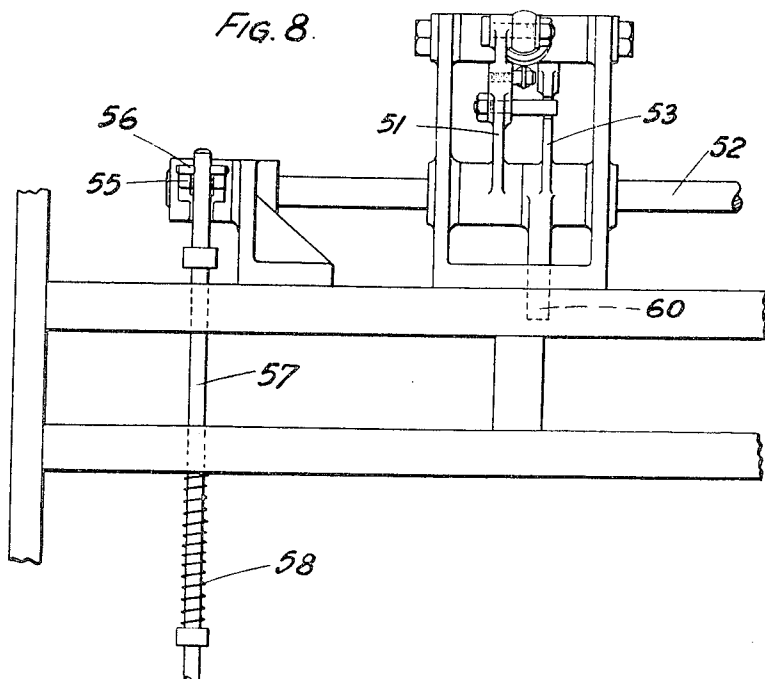
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FIG. 9.

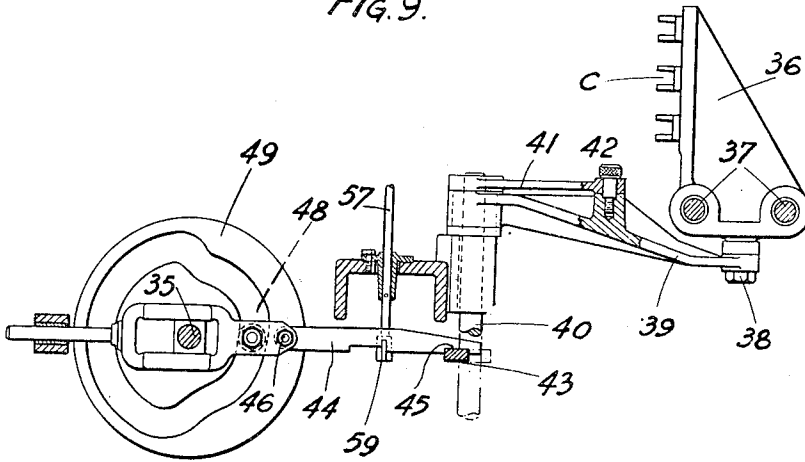
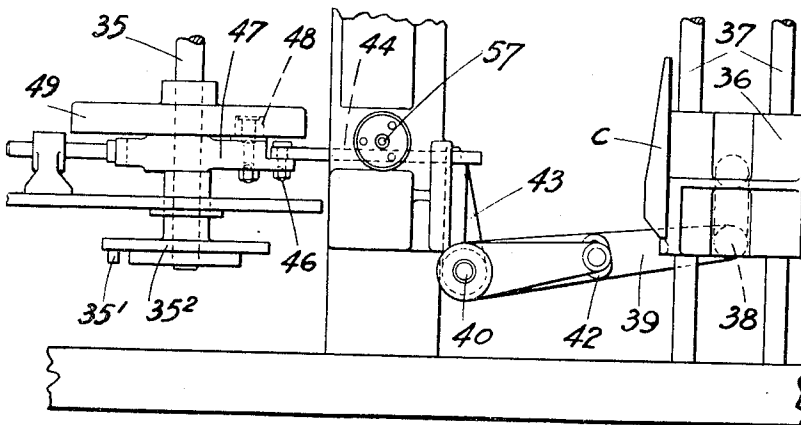


FIG. 10.



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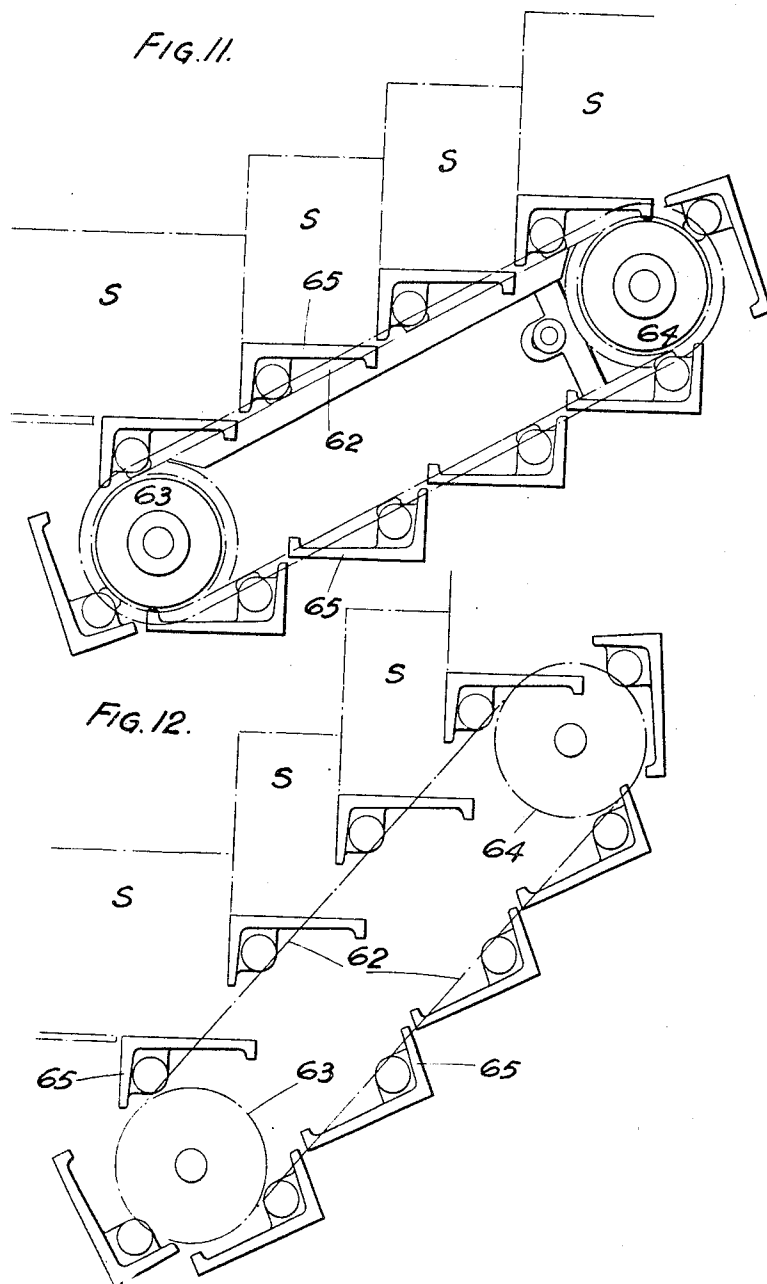
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8 Sheets-Sheet 8



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## UNITED STATES PATENT OFFICE

2,551,557

MACHINE FOR FINISHING THE PAGES TO  
BE DEALT WITH IN BOOKBINDING MA-  
CHINESJohn Albert Edward Buris, Frinton on Sea, Eng-  
land, assignor to R. Hoe & Co. Inc., New York,  
N. Y., a corporation of New YorkApplication August 1, 1947, Serial No. 765,571  
In Great Britain April 6, 1946

9 Claims. (Cl. 90--21)

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This invention relates to new and useful im-  
provements in a machine for finishing the pages  
to be dealt with in a bookbinding machine, fully  
described and represented in the following speci-  
fication and the accompanying drawings forming a  
part of the same.

It is at the present time the usual practice to  
assemble signatures (or sheets) to be bound and  
in order to form a clean edge to pass them to a  
guillotine machine which operates to make a  
shear cut of the edges of the associated signa-  
tures. These guillotine machine which may have  
three cutters mutually at 90° to each other  
tend to slow down the rate of production for the  
reason among other things that they operate with  
a reciprocating motion.

The main object of this invention is to provide  
a mechanism which will enable the rate of pro-  
duction of finished signatures to be increased and  
this object is achieved broadly stated by provid-  
ing rotary cutters which operate in the manner  
of milling cutters to prepare and finish the edges  
of the signatures. Thus to finish the three edges  
of a collection of signatures three rotary cutters  
would be employed one for each edge. The  
cutters would usually operate on assembled signa-  
tures as they are advanced on a table past the  
cutters. The signatures could be supplied to the  
table from a hopper from one end of which a pre-  
determined number or bunch of signatures would  
at intervals pass to the table at a level different  
from that of the hopper. Having arrived at this  
table this bundle of signatures is pressed forward  
by a pusher against reaction blades which are  
at this stage disposed behind the rearmost  
end of the signatures already on the table; these  
fingers, which are tapered, are then withdrawn  
from a position between the signatures whereupon  
the pusher mechanism operates to advance the  
last bundle up to the preceding signatures. At  
the forward end of this table is employed a deliv-  
ery which would generally be such as to offer  
some resistance to movement of the signature so  
that the pusher and the reaction blades can exert  
some pressure on the signatures to enable satis-  
factory cutting to be effected.

The invention is illustrated in the accompany-  
ing drawings in which Fig. 1 is a perspective view  
prepared to illustrate diagrammatically the main  
operating parts of a machine to carry the inven-  
tion into practical effect, Fig. 2 is a sectional  
elevation showing the signature cutting assembly,  
Fig. 3 is a plan view of Fig. 2, Fig. 4 is a sectional  
elevation of mechanism provided to take signa-  
tures from a supply zone or hopper and to deliver

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them to the feed table, this figure also illustrat-  
ing the mechanism to advance the signatures along  
the feed table and past the rotary cutters shown  
in Figs. 2 and 3. Fig. 4A is a detailed view show-  
ing the drive mechanism employed, Figs. 5-8 are  
detailed views of the advancing mechanism, Figs.  
5-7 showing the mechanism in different posi-  
tions while Fig. 8 is an elevation of the mecha-  
nism and Figs. 9, 9A and 10 are respectively sec-  
tional elevations and plan view of a mechanism to  
co-operate with the advancing mechanism to  
hold signatures while the advancing mechanism  
is retracting.

Figs. 11 and 12 are two diagrammatic side ele-  
vations of a modified form of delivery to take  
away signatures after they have been cut or  
trimmed.

Reference will first be made to Fig. 1 in which  
the signatures are indicated at S, these signatures  
being advanced along a table T (Fig. 2) by a  
pusher B which is reciprocated, the requisite  
packing of the signatures on the table being  
maintained (while the pusher B is retracted), by  
holding fingers or arms C which are moved in  
step with the operation of the pusher B so as to  
move clear of the pusher as it advances on its  
feeding stroke.

The action of the pusher B is to recede to en-  
able a fresh collection of signatures such a col-  
lection being indicated at D to be laid in front of  
it so as, on the advancing movement of the  
pusher it advances that collection D and in so  
doing advances the line E of signatures.

The line E of signatures is thus caused to ad-  
vance progressively as fresh collections D are  
added while the leading signatures are caused  
by the advancement to be taken by a delivery ar-  
rangement.

While the signatures in the line E are ad-  
vanced, they are caused to pass through rotary  
cutters F<sup>1</sup>, F<sup>2</sup> and F<sup>3</sup> which are constantly ro-  
tated, the cutters are disposed to operate to cut  
or trim the three free edges of the signatures so  
that the signatures in the line E are finally deliv-  
ered with their free edges trimmed.

The cutters F<sup>1</sup>, F<sup>2</sup> and F<sup>3</sup> which may have  
straight or preferably as shown, helical cutting  
teeth, are rotated at a high speed and it has been  
found that signatures so trimmed have a finish  
equal to that given by the customary guillotine  
cutting and yet the speed of operation can be very  
much greater.

Reference will now be made to Figs. 2 and 3  
which indicate the manner of driving and adjust-  
ing the cutters, F<sup>1</sup> and F<sup>2</sup>, which are arranged

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for individual drive from motors 1a and 1b respectively, and are arranged to be relatively adjustable to handle signatures of different sizes (i. e. page dimensions). Thus the vertical cutters F1 and F2 which cut the top and bottom edges of a signature are adjustable towards and away from one another for which purpose these cutters are mounted on spindles 2 journalled in bearings 3 on slides 4, themselves mounted to slide on V guides 5 on the table 6 of the machine. The adjustment is effected by a screw threaded rod 7 having an operating hand wheel 7a, the rod having right and left hand screw parts so that its rotation causes the slides 4 to move equally towards and away from one another to maintain their equal setting about the centre line of the machine. To permit this adjustment the drive to the cutters F1 and F2 from the motors 1a and 1b is effected through belts or chains 8a and 8b respectively, which are maintained taut while yet accommodating the movement of the slides by jockey pulleys or gears 9 carried on arms 10 and urged to swing by springs 11, the pulleys or gear wheels on the motor spindle and on the spindle 2 being indicated at 1' and 2' respectively.

The horizontal cutter F is adjustable towards and away from the table supporting the signatures—this adjustment is effected by supporting the spindle 2 carrying that cutter from a slide 12 slidable on a vertical guide 13 rising from the machine frame 14 and this slide is movable on the guide by a screw threaded rod 15 which can be turned by a hand wheel 16. Drive to the spindle of this horizontal cutter is effected again by belts or chains 17, operating through an intermediate wheel 18, the upper belt or chain run passing over a jockey pulley 19 on a lever which is spring loaded to keep the desired tension of the belt or chain driving the cutter F.

In order to provide for the removal of the trimmings which would be formed by the cutting operation, each of the cutters F is housed in a casing 20 which shrouds the cutter except at the desired cutting zone and each casing 20 has an opening 21 for connection to a suction line to evacuate the waste material.

Reference will now be made to Figs. 1, 4 and 5-10 which illustrate in detail the apparatus for feeding signatures in stacks or batches of a predetermined number. At the feed end of the table T is an endless flexible chain or belt conveyor 22 which passes around chain wheels or pulleys 23 one of which is driving the wheels 23, being so positioned as to provide a reception run R, a feed run R<sup>1</sup> and a return run R<sup>2</sup> of which the feed run R<sup>1</sup> passes down vertically at the feed end of the table T.

Spaced at intervals along this conveyor 22 are skeleton pockets 24 each having a spring-clip retaining finger 25. A stack or bunch of signatures is fed to each pocket 24 as it passes on to the reception run R and as the various pockets pass in succession on the vertical feed run R<sup>1</sup> they pass through fingers 26 forming a rearward extension of the table T. At the time the skeleton pockets 24 pass these fingers 26, the bunch of signatures held in the pockets are stripped therefrom and held by the fingers 26 at the end of the table T.

This depositing of the bunch of signatures is timed to occur while the pusher B is in its retracted position so that, as the pusher moves forward on its feeding stroke it encounters the freshly delivered batch of signatures and displaces them along the table T. The preceding

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batches already on the table are consequently advanced and in this way the signatures S are intermittently moved forward past the cutters F.

For the purpose of holding the signatures S already advanced by the pusher B while that pusher retracts, the holding fingers C are provided. It is necessary to withdraw these fingers as the pusher B advances and to achieve this, fingers C are retracted from the sides of the advancing batches of signatures.

So that there shall be no loss of pressure at the time of the advance of signatures S on the table T the pressure face of the pusher B is grooved at 27 to accommodate the fingers C which are arranged to move sideways into the grooves 27 and so pass snugly behind the last batch advanced by the pusher B which can then be retracted.

Operation of the pusher B and the fingers C in the required time relationship is effected as follows. The pusher has extending from its rear face a rod 28 slidable in guides 29 (Fig. 4) and coupled by a link 30 to an arm 31 pivoted at 32 and having a roller 33 engaging a box cam 34 on a driven shaft 35, the cam being shaped and proportioned to impart the required advance and return movements to the pusher B.

The fingers C are supported by arms 36 (Fig. 9) rising from transverse guide rods 37. The arms (of which only one is shown in full detail) are pivoted at 38 (Figs. 9 and 10) to the free end of arms 39 freely supported on a spindle 40 to which is secured an arm 41 having a pin which provides an adjustable connection 42 to the arm 39 which has various holes to suit varying signature lengths. Also secured to the spindle 40 is an arm 43 which is disposed to the line of action of a driving bar 44 having a driving notch 45 to engage the arm 43. This bar is moved backwards and forwards by being coupled by a pivot 46 to a slide 47 having a roller 48 engaging a box cam 49 also secured to the shaft 35 to which the pusher operating cam 34 (Fig. 4) is secured. Hence assuming that the notch 45 (Figs. 9 and 10) in the bar 44 is allowed to engage the arm 43, that arm will be rocked to withdraw the holding fingers C while the pusher B is advancing a fresh batch of signatures and to return the fingers C as the pusher B is about to retract.

Provision is however made to prevent withdrawal of the fingers C in the event that a fresh batch of signatures is not present in front of the pusher: it will be realised that if, in such a circumstance the fingers C were withdrawn, the pressure applied to the series of signatures already on the table T and advancing past the cutters F would be removed with possibly defective cutter action which is best achieved by packing the signatures against one another.

For this reason, the driving bar 44 is controlled as to its effectiveness by a device which "feels" whether a new batch is present in front of the pusher B. This feeling device comprises a pin 50 (Figs. 5 and 6) slidable in a guide 50<sup>1</sup> and pivoted to an arm 51 itself mounted to rock on a fixed pivot shaft 52. The arm 51 is fast with a second arm 55 which is disposed to engage a pin 56 on a lifting rod 57 urged downwardly by a spring 58 and having at its lower end a hook 59 to engage the driving bar 44. Also pivoted on the pivot shaft 52 is a "sensing" lever 53 which is connected by a spring 54 to the arm 51. This sensing lever has a nose 60 to be engaged and rocked by the pusher B as it recedes.

The effect of engagement of the nose 60 by the

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pusher B is to rock the lever 53 which in its turn rocks the arms 51 and 55 through the spring and this projects the feeler to the right from the position shown in Fig. 6. If now at this time a fresh batch of signatures is present in the pocket 24 which is about to lay a fresh batch on the fingers 26, this batch will provide an obstruction to the forward movement of the pin 50 and in consequence the pin 50 and the arm 51 will be arrested (as seen in Fig. 7), while the lever 53 in continuing to rock will merely tension the spring 54. The clearance or lost motion between the arm 55 and the pin 56 is such as to enable the pin 50 to be projected into sensing position and if, as described, the pin senses an obstruction then the arm 55 just moves idly up to the pin 56 but does not engage it. The hook 59 is therefore not raised and the driving notch 45 imparts movement to the arm 44 and hence to the holding fingers C.

If however a batch is not present, then the finger 59 meets no obstruction, the continued movement of the nose 59 continues through the spring 54 to rock the arms 51 and 55 as seen in Fig. 5 and now the arm 55 engages and raises the pin 56 which in its turn operates through the rod 57 and hook 59 to lift the driving bar 44 so that its driving notch 45 is held clear of the arm 43. In this condition of the parts when the pusher next advances, the fingers C are not withdrawn and therefore despite the absence of a fresh batch the pressure is maintained.

It has been stated that the signatures S as they pass the cutters F' should be under compression for a satisfactory cutting by the cutters. This of course implies that (unless a very long series of signatures S is present on the table T so that the inertia would be sufficient) provision should be made to set up a resistance to the delivery of the treated signatures.

In the preferred way of achieving this result, the table T can, as seen in Fig. 2 be terminated by a delivery passage the walls of which are constituted by resilient material such as rubber, or through spring loaded gates of metal or other hard material. One of the walls is indicated at 61 and it will be seen that they diverge from their receptive mouth and this mouth is designed so as to require distention by the signatures S as they pass through, this distention setting up the required resistance.

A modified arrangement is shown in Figs. 11 and 12. In this arrangement there is disposed at the delivery end of the table T a step delivery conveyor which comprises an endless conveyor 62 which passes about wheels 63, 64. On this conveyor are mounted L shaped platforms 65 one of the limbs of the L forming a platform to receive individual signatures from the table T while the other limb, which is vertically disposed as seen in the figures when the platforms are passing on their operative runs, forms a reaction surface against which the signatures S are pressed by the advancing action of the pusher B at the remote end of the table. With this arrangement, each platform will in succession operate to "slice" a signature from the stream while still affording the required reaction.

In order to provide for a variation of the slicing effect to suit signatures S of different thicknesses, the conveyor assembly can be mounted to swing about the axis of the wheel 63. The effect of swinging the assembly will be, as is seen from Fig. 12 to vary the degree of overlap of the platforms and thus effect a change in the effective

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surface of the horizontal platforms which are presented to the stream of signatures.

Reference will now be made to Fig. 4A which illustrates the arrangement employed to drive the shaft 35 continuously while the conveyor 22 is operated intermittently. It will be apparent that the conveyor 22 must be operated at intervals such as to carry a fresh batch of signatures into position only while the pusher B is fully retracted. The cam 34 to operate the pusher has a dwell portion and while this dwell portion is effective the conveyor 22 is moved. This is achieved by mounting one of the wheels 23 driving the conveyor, on a shaft 23<sup>1</sup> which is geared through gearing 23<sup>2</sup>, 23<sup>3</sup> to the driven member 23<sup>4</sup> of a Geneva motion having slots 23<sup>5</sup> to receive a driving pin 35<sup>1</sup> on a driving and locking disc 35<sup>2</sup> secured to the shaft 35 which is continuously driven.

20 What I claim is:

1. To finish the edges of signatures, apparatus comprising a plurality of rotary cutters, means positioning the cutters to operate respectively on the edges of the signatures, power means to rotate the cutters, a pusher device to advance signatures past the cutters, the said device having a grooved pressure face, means to retract and advance the device, means to feed a supply of signatures ahead of the pressure face when the device is retracted, holding components to enter the grooves in said pressure face to press behind signatures already advanced and to hold those signatures while the pusher is retracted, and means to move the holding components into and out of holding position in step with the operation of the pusher device.

2. To finish the edges of signatures, apparatus comprising a plurality of rotary cutters, means positioning the cutters to operate respectively on the edges of the signatures, power means to rotate the cutters, a pusher device to advance signatures past the cutters, means to retract and advance the device, means to feed a supply of signatures ahead of the device when it is retracted, holding means to hold advanced signatures while the device is retracted, and means to detect the absence of signatures ahead of the pusher device and to hold the holding device against withdrawal from holding position while the pusher device moves to advance.

3. To finish the edges of signatures, apparatus comprising a plurality of rotary cutters, means positioning the cutters to operate respectively on the edges of the signatures, power means to rotate the cutters, a pusher device to advance signatures past the cutters, the said device having a grooved pressure face, means to retract and advance the device, means to feed a supply of signatures ahead of the pressure face when the device is retracted, holding components to enter the grooves in said pressure face to press behind signatures already advanced and to hold those signatures while the pusher is retracted, means to move the holding components into and out of holding position in step with the operation of the pusher device, and means to detect the absence of signatures ahead of the pusher device and to hold the holding device against withdrawal from holding position while the pusher device moves to advance.

4. To finish the edges of signatures, apparatus comprising a plurality of rotary cutters, means positioning the cutters to operate respectively on the edges of the signatures, power means to rotate the cutters, a pusher device to advance sig-

natures past the cutters, the said device having a grooved pressure face, means to retract and advance the device, an endless conveyor to receive signatures at one point in its travel, means to move the conveyor to deposit those signatures ahead of the pusher device when it is retracted, holding components to enter the grooves in said pressure face to press behind signatures already advanced and to hold those signatures while the pusher is retracted, and means to move the holding components into and out of holding position in step with the operation of the pusher device.

5. To finish the edges of signatures, apparatus comprising a plurality of rotary cutters, means positioning the cutters to operate respectively on the edges of the signatures, power means to rotate the cutters, a pusher device to advance signatures past the cutters, means to advance and retract the device, an endless conveyor to receive signatures at one point in its travel, means to move the conveyor to deposit those signatures ahead of the pusher device when it is retracted, holding means to hold advanced signatures while the device is retracted, and means to detect the absence of signatures ahead of the pusher device and to hold the holding device against withdrawal from holding position while the pusher device moves to advance.

6. To finish the edges of signatures, apparatus comprising a plurality of rotary cutters, means positioning the cutters to operate respectively on the edges of the signatures, power means to rotate the cutters, a pusher device to advance signatures past the cutters, the said device having a grooved pressure face, means to advance and retract the device, means to feed a supply of signatures ahead of the device when it is retracted, holding means to enter the grooves in said pressure face to press behind and to hold the advanced signatures while the pusher device is retracted, means to detect the absence of signatures ahead of the pusher device and to hold the holding device against withdrawal from holding position while the pusher device moves to advance and a delivery device to which the signatures are advanced from the cutters, the said device being formed to set up resistance to the movement of the signatures.

7. To finish the edges of signatures, apparatus comprising a plurality of rotary cutters, means positioning the cutters to operate respectively on the edges of the signatures, power means to rotate the cutters, a pusher device to advance signatures past the cutters, means to advance and re-

tract the device, an endless conveyor to receive signatures at one point in its travel, means to move the conveyor to deposit those signatures ahead of the pusher device when it is retracted, holding means to hold advanced signatures while the device is retracted and a delivery device to which the signatures are advanced from the cutters, the said device being formed to set up resistance to the movement of the signatures.

8. In a signature trimming machine comprising cutters positioned to trim the edges of stacks of signatures fed along a table in succession, a conveyor arranged to receive a stack of signatures in superposed relation with the pages horizontally arranged and to deposit them on the table with the pages arranged vertically, a reciprocable pusher having a grooved face, and adapted to push the signatures along the table toward the cutters during a working stroke and means movable in the grooved face to maintain pressure on the signatures during a return stroke of the pusher.

9. In a signature trimming machine comprising cutters positioned to trim the edges of stacks of signatures fed along a table in succession, a conveyor arranged to receive a stack of signatures in superposed relation with the pages horizontally arranged and to deposit them on the table with the pages arranged vertically, a reciprocable pusher having a grooved face, and adapted to push the signatures along the table toward the cutters during a working stroke, means movable in the grooved face to maintain pressure on the signatures during a return stroke of the pusher, and a delivery having a resiliently walled outlet adapted to resist passage of the trimmed products.

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