

[54] **PAPER PUNCHING MACHINE**

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[22] Filed: **Apr. 25, 1972**

[21] Appl. No.: **247,411**

[52] U.S. Cl. **83/256, 83/255, 83/281, 83/405, 83/420, 83/516, 83/560**

[51] Int. Cl. **B26f 1/02**

[58] Field of Search 83/255, 256, 281, 83/404.2, 405, 420, 516, 517, 560

[56] **References Cited**

UNITED STATES PATENTS

1,882,451	10/1932	Sherman	83/405
3,452,628	7/1969	Pfaffle	83/167

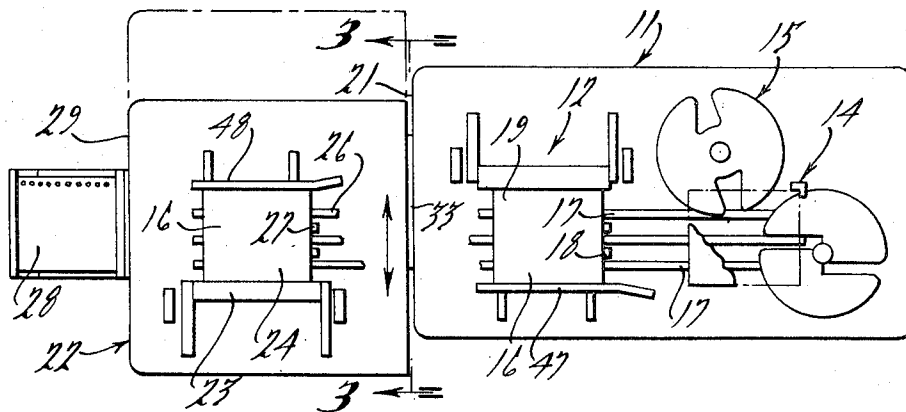
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[57] **ABSTRACT**

A machine for performing more than one punching operation on groups of sheets in a continuous manner. The machine has a first unit with a stacking station, pushers and conveyors and a first punching station. An auxiliary unit is mounted on one end of the first unit and is laterally adjustable. This second unit carries a second punching station for the opposite edges of the sheets. Both units have a common drive. In a modification, the second unit is fixed with respect to the first, but feeds the sheets at right angles to the first direction of movement to a second punching station thereon. A third unit is mounted on the exit end of the second unit and is laterally adjustable, carrying a third punching station for a third edge of the sheets.

7 Claims, 6 Drawing Figures



SHEET 1 OF 2

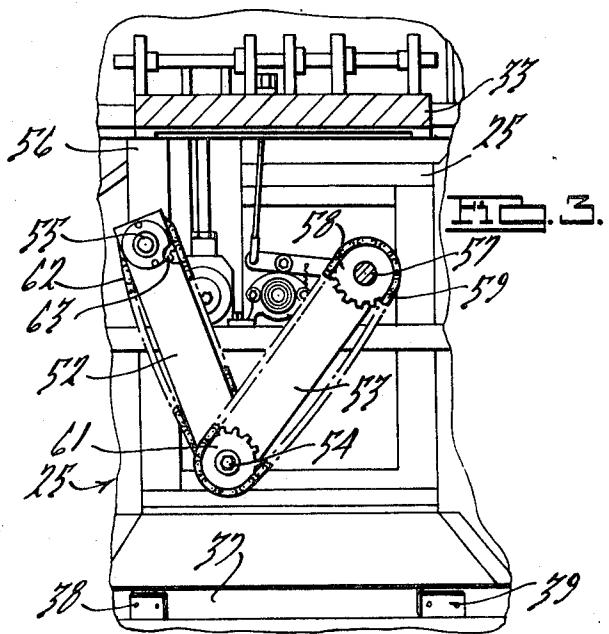
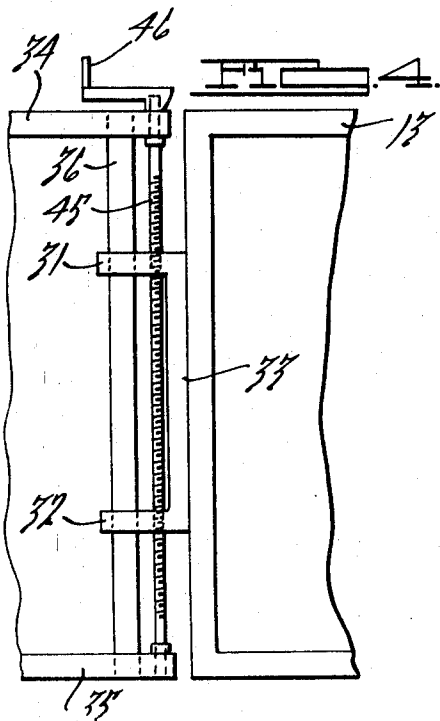
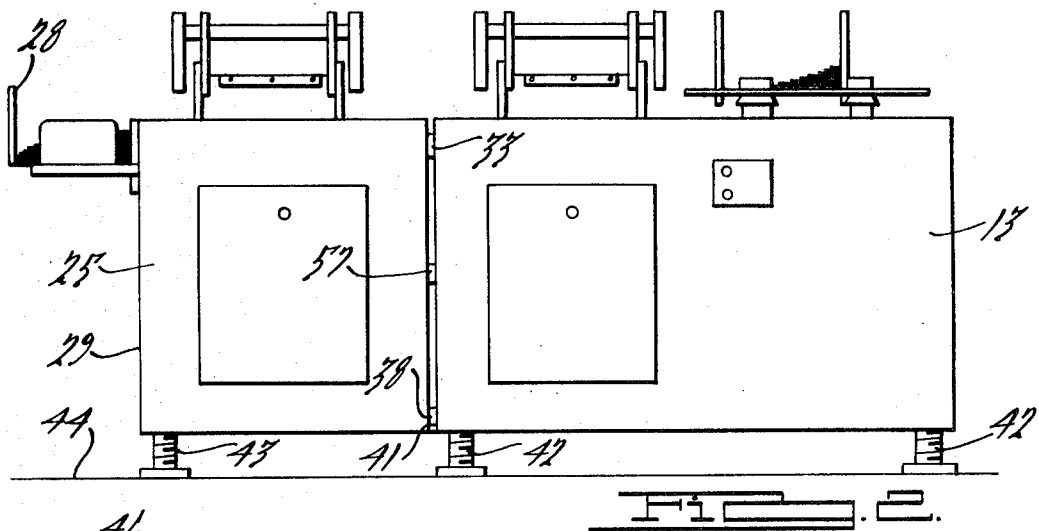
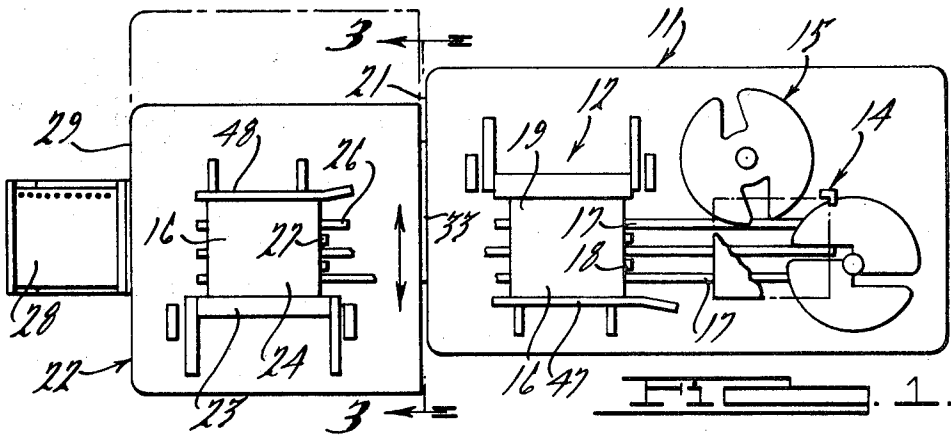


FIG. 5.

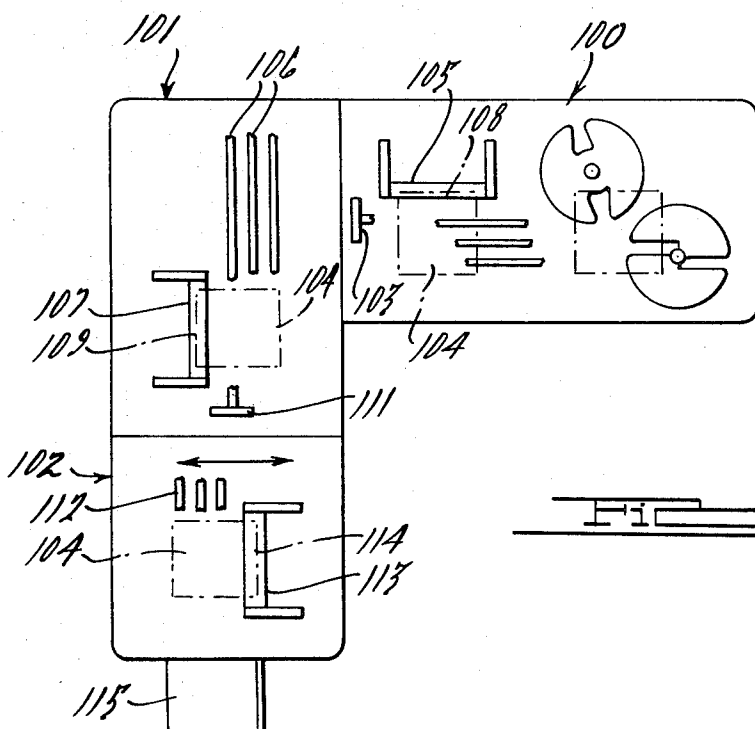
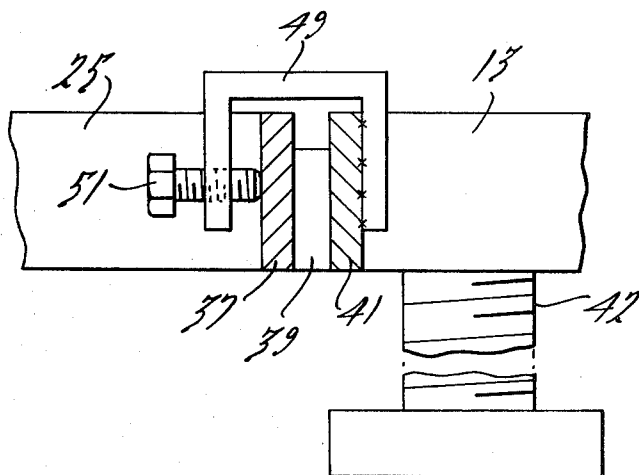


FIG. 6.

PAPER PUNCHING MACHINE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to the performance of punching (that is, hole punching, cutting or cornering) operations on groups of sheets such as wire-bound or loose leaf books. An example of such a machine is my previous U.S. Pat. No. 3,452,628 issued July 1, 1969. It is frequently desired to perform two or more operations on such sheets, for example, hole punching one edge plus cornering or cutting off the spine of signatures and then punching a binding pattern along one edge. In other cases, such as for record keeping systems, it is desired to perform punching operations along three edges of the sheets.

2. Description of the Prior Art

As far as it is known, previous methods of accomplishing the above stated purposes have necessitated the collecting of the groups of sheets after a first operation and transporting them to stations for performing the subsequent punching functions. This is a timeconsuming process which greatly increases the production costs.

BRIEF SUMMARY OF THE INVENTION

It is an object of the present invention to provide a novel and improved construction for performing two or more punching operations on groups of sheets in a continuous manner, thus eliminating the need for recollating and transporting the groups of sheets from one station to another.

It is another object to provide an improved punching arrangement of this character which is quickly adjustable to accommodate various widths of sheets.

It is another object to provide a machine of this nature which will enable the spines of stacked signatures to be cut off at a first station and continuously fed to a second station where the binding pattern is punched, thus eliminating the need for cutting the spines on a separate guillotine prior to punching.

It is also an object, in a modified form of the invention, to provide an improved machine for punching three sides of the sheets in a continuous operation.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic plan view of one form of the invention in which a unit carrying a second punching station is mounted on the first unit and is laterally adjustable;

FIG. 2 is a side elevational view of the machine of FIG. 1;

FIG. 3 is a fragmentary perspective cross-sectional view taken along the line 3—3 of FIG. 1 and showing the mounting means and drive for the second unit;

FIG. 4 is a fragmentary plan view showing the mounting and adjusting means for the second unit;

FIG. 5 is a fragmentary cross-sectional view in elevation of the adjacent lower portions of the main and auxiliary units showing the manner of securing them together; and

FIG. 6 is a schematic plan view of a modified form of the invention in which three punching stations are provided for three edges of a sheet, the third station being adjustable.

DESCRIPTION OF THE PREFERRED EMBODIMENT

A main punching unit is generally indicated at 11 and has a punching station generally indicated at 12 mounted on a base 13. As illustrated, this construction is similar to that shown and described in the aforementioned U.S. Pat. No. 3,452,628, although it will be understood that the principles of this invention are applicable to either construction. As shown, a stacking station generally indicated at 14 is located adjacent one end of station 12, and separating means generally indicated at 15 is disposed below the stacking station. The separating means will form groups of sheets 16 which are transported by conveying belts 17 and pushers 18 to station 12. At this station, a punching, cutting or cornering operation may be performed along margin 19 of the group of sheets 16.

As described in the aforesaid patent, a delivery trough was attached to the exit end 21 of base 13 for receiving the sheets delivered from the punching station. In accordance with the present invention, this delivery trough is removed and a second punching unit generally indicated at 22 is attached to end 21 of base 13. This unit has an additional punching station 23 adapted to operate on the opposite margin 24 of the groups. The unit has a base 25, conveyors 26 and pushers 27 which feed groups 16 to station 23 and then to a delivery trough 28 attached to the exit end 29 of base 25. As in the previous machine, the restacking at the delivery trough is made in the same order as the original packing order.

Base 25 is mounted on end 21 of base 13 in such manner as to permit lateral adjustment thereof at right angles to the direction of movement of the sheets, that is, in the directions of the double arrow of FIG. 1. The mounting means comprises a pair of extensions 31 and 32 adjacent the top of exit end 21 of base 13 and spaced inwardly from the sides thereof as seen in FIG. 4. These extensions may be carried by a reinforcing piece 33 secured to end 21 of base 13. Base 25 has a pair of side members 34 and 35 between which extend a cylinder rod 36, this rod passing through and secured to aligned apertures in extensions 31 and 32. Thus, base 25 is suspended from base 13. A lower cross piece 37 on base 25 facing end 21 of base 13 carries a pair of flat anti-friction plates 38 and 39 (FIG. 3). These plates rest against a lower frame member 41 of base 13 (FIG. 2). Base 13 has four screw-adjustable legs 42 at its corners whereas base 25 has two screw-adjustable legs 43 at its exit end 29. By adjusting legs 42 to raise base 13, base 25 will be lifted from floor 44, thus permitting lateral adjustment of unit 22 by means of rod 36 sliding in extensions 31 and 32 and pads 38 and 39 sliding along member 41.

The means for adjusting unit 22 with respect to base 12 comprises a lead screw 45 rotatably mounted between members 34 and 35 adjacent rod 36 and threadably connected to extensions 31 and 32. This screw has a removable crank 46 accessible from the outside of the frame 25. By rotating screw 45 after frame 25 has been lifted from floor 44, unit 22 may be laterally adjusted to achieve any desired spacing between punching stations 12 and 23. Side pushers 47 and 48 mounted opposite these two punching stations respectively are adjustable with respect to the individual punching station to achieve the desired guidance of the sheets.

Means are provided for clamping unit 22 in its adjusted position. In the illustrated embodiment, this means comprises an inverted U-shaped clamp 49 (FIG. 5) secured to an intermediate portion of base member 41 and extending over base member 37. A clamping screw 51 is threadably mounted in bracket 49 for clamping the bases together.

Means are provided for connecting the operating elements of unit 22 to the drive for unit 11. This means comprises a pair of elongated members 52 and 53 pivotally connected at 54, the outer end of member 52 being pivotally mounted at 55 to a member 56 of frame 25. A shaft 57 is rotatably mounted at the outer end of member 53 and is driven from frame 13. A sprocket 58 carried by shaft 57 is connected by a chain 59 to a sprocket 61 on pivot 54. Another sprocket (not shown) coaxial with sprocket 61 drives a chain 62. Pivot 55 comprises a shaft carrying a sprocket 63 driven by chain 62, and is connected to the various components such as the punching, advancing and jogging mechanisms carried by unit 22. Members 52 and 53 may fold or unfold depending on the laterally adjusted position of unit 22 without disturbing its drive which will be automatically synchronized with the drive for unit 11.

In operation of the embodiment of FIGS. 1 to 5, when it is desired to adjust auxiliary unit 22 with respect to main unit 11, level screws 42 of the main unit will be adjusted to raise this unit so that auxiliary unit 22 will be lifted from floor 44. Clamping screw 51 will be loosened. Crank 46 will then be rotated, sliding unit 22 laterally with respect to unit 11. During this process, rod 36 will ride in extensions 31 and 32 and anti-friction pads 38 and 39 will slide along member 39. Members 52 and 53 will fold or unfold relative to each other while still maintaining intact the driving train from unit 11 to unit 22. After unit 22 has been adjusted, it will be clamped in its new position by screw 51. Side pushers 47 and 48 will be adjusted accordingly. When unit 11 is started, unit 22 will run synchronously. The stacks of sheets 16 will be fed first through punching station 12 at which their margins 19 will be operated upon, and then through punching station 23 for operating on margins 24. The stacks will then be placed in delivery trough 28.

FIG. 6 is a schematic view of a modified form of the invention which comprises a first or main unit 100, a second unit 101 and a third unit 102. This arrangement may be used where it is desired to perform punching, cutting or cornering operations along three edges of groups of sheets. Unit 100 will be similar to unit 11 of the previous embodiment. Unit 101 will be fixed with respect to unit 100. Pusher means 103 will feed the groups of sheets 104 from the punching station 105 of unit 100 onto conveyor belts 106 of unit 101. These conveyor belts run at right angles to the original angle of movement and will feed the groups of sheets 104 to a second punching station 107. In this case punching station 105 will operate along margin 108 of sheets 104 and punching station 107 along margin 109.

Pusher means 111 will then move the groups of sheets 104 onto unit 102 which has belts 112 carrying the sheets to a punching station 113. This punching station will operate on the edge 114 of sheets 104 opposite edge 109. The sheets will then be carried to a delivery trough 115 at the exit end of unit 102. In this embodiment, unit 102 is mounted for lateral movement with respect to unit 101 in the direction of the double

headed arrow in FIG. 6. The mounting means will be similar to that described above with respect to FIGS. 1 to 5. The driving means for unit 100 may be connected by any conventional method through unit 101. The connection to the operating components of unit 102 will be by a construction like that shown in FIG. 3, so that all three units may be driven synchronously from a common power source.

I claim:

1. Means for performing punching operations along two opposite margins of a group of sheets comprising a first unit having means for conveying a group of sheets to and from a first punching station carried thereby, said first punching station being so disposed as to perform a punching operation along a first side margin of the sheets, a second unit mounted on the exit end of said first unit and having a second punching station so disposed as to perform a punching operation at the opposite margin of said sheets, the means mounting said second unit on said first unit permitting lateral movement of the second unit, means for adjusting the lateral position of said second unit with respect to the first unit, means for securing the second unit in its adjusted position with respect to the first unit, and drive means interconnecting said first and second units for synchronous operation, said drive means being automatically adjustable simultaneously with the adjustment of said second unit without interfering with the driving connection.

2. The combination according to claim 1, said means for supporting said second unit comprising a pair of extensions on the exit end of said first unit and a rod extending across the upper portion of said second unit and passing through said extensions, anti-friction means between the lower portions of said two units, a lead screw interconnecting the first and second units, and crank means for said lead screw.

3. The combination according to claim 2, said means for securing the units in their adjusted positions comprising a bracket secured to one unit and overlapping the other unit, and a clamping screw carried by said bracket.

4. The combination according to claim 1, said interconnecting drive means comprising a pair of pivotally connected elongated members, one of said members being pivoted to said second unit and carrying a shaft at said pivot connected to the second unit operating components, the other member carrying a shaft at its outer end connected to the first unit drive, an intermediate shaft at the pivot connection between said two members, and chain and sprocket drives connecting said shafts, whereby lateral movement of said second unit will not affect the driving connection between the first and second units.

5. The combination according to claim 1, further provided with means for lifting said second unit from the floor so that it may be laterally adjusted, said means comprising adjusting screws on said first unit.

6. The combination according to claim 5, said means for supporting said second unit comprising a pair of extensions on the exit end of said first unit and a rod extending across the upper portion of said second unit and passing through said extension, anti-friction means between the lower portions of said two units, a lead screw interconnecting the first and second units, and crank means for said lead screw.

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7. In combination, a first unit for separating groups of paper sheets from a stack and feeding them to a punching station carried by said first unit, said punching station being so disposed as to operate on one margin of the sheets, means for advancing said sheets to a second unit attached to the exit end of said first unit, means on said second unit for moving the sheets at right angles to the first direction of movement, a second punching station on said second unit so disposed as to operate on a second margin of said sheets at right angles to the first margin, a third unit mounted on the exit end of said second unit, said third unit having a

third punching station so disposed as to operate on the margin of said sheets opposite the margin operated on by said second station, means permitting lateral adjustment of said third unit with respect to said second unit, means for securing said third unit in its adjusted position with respect to the second unit, and synchronous driving means interconnecting the operating components of the second and third units, said interconnecting means being automatically adjustable when said third unit is laterally adjusted without disturbing the synchronous driving connection.

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