

[54] PAPER DRILLING MACHINE

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[51] Int. Cl. B23b 39/16, B23b 47/00

[58] Field of Search 408/52, 87, 95, 98; 83/547

[56] References Cited
UNITED STATES PATENTS

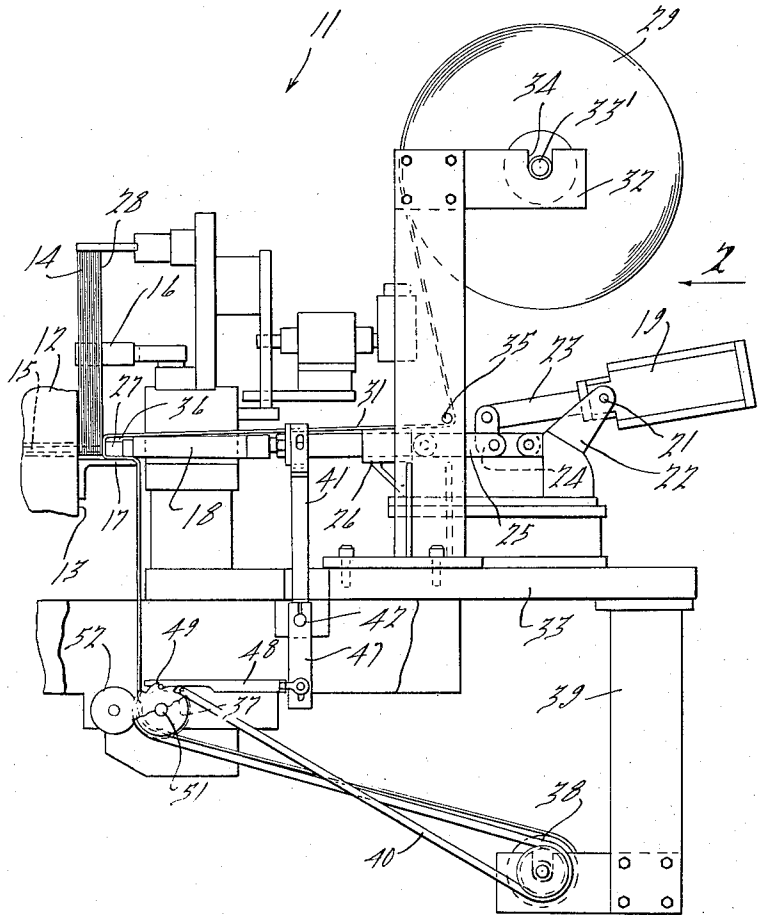
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[57] ABSTRACT

Stacks of sheets to be wire or loose-leaf bound are fed in vertical position to a row of drills. A clamp with a wooden backup block presses against the area to be perforated, and the drills advance through the sheets and into the backup block. In order to prevent ragged edges from forming on the last sheet in each stack, due to enlarged backup holes, a roll of paper is provided which is fed with small steps between the backup block and stack. Ragged edges which would otherwise be formed in the last sheet of the stack are formed instead in the backup sheet, which is taken up on another roll as waste paper.

3 Claims, 2 Drawing Figures



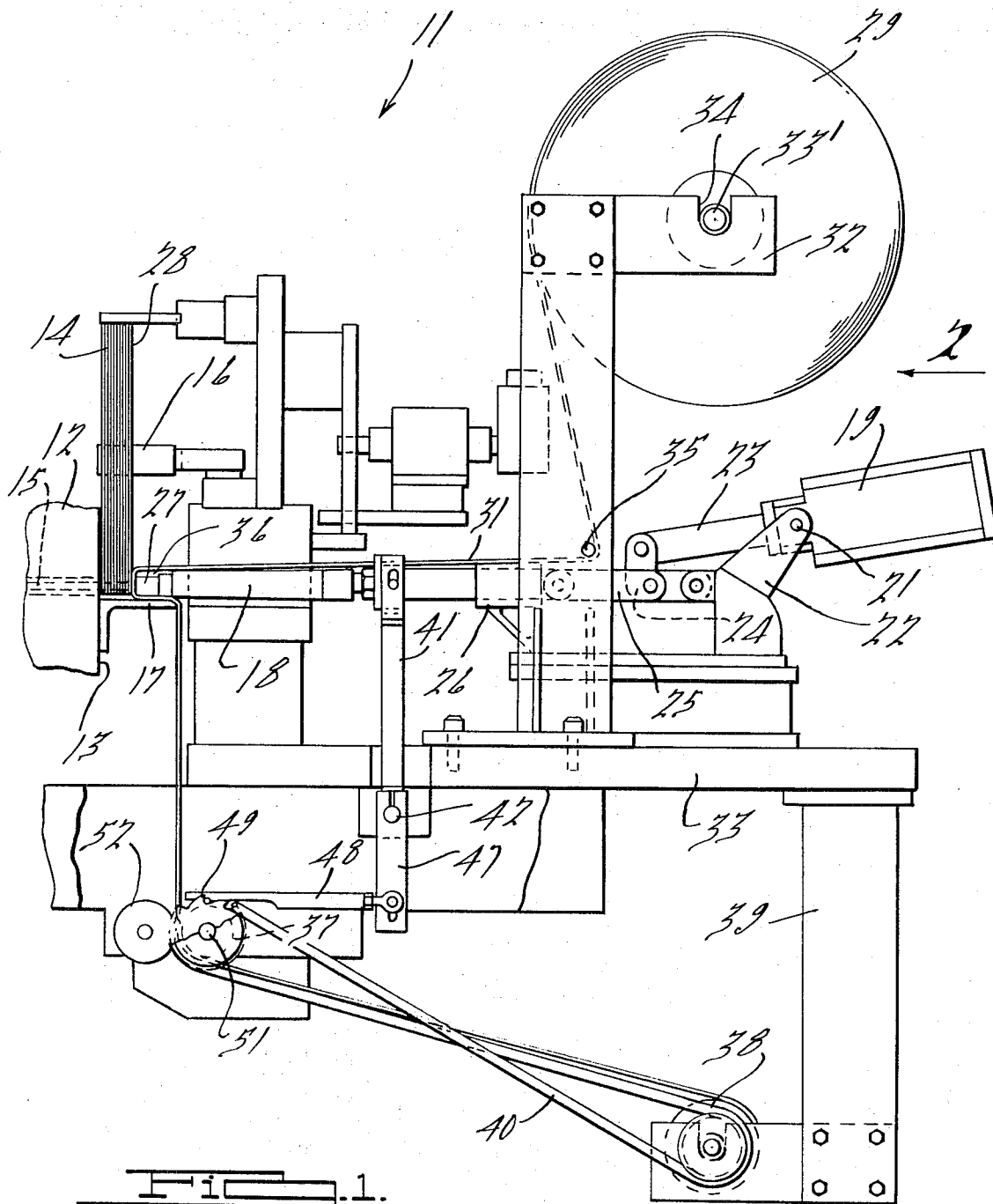


FIG. 1.

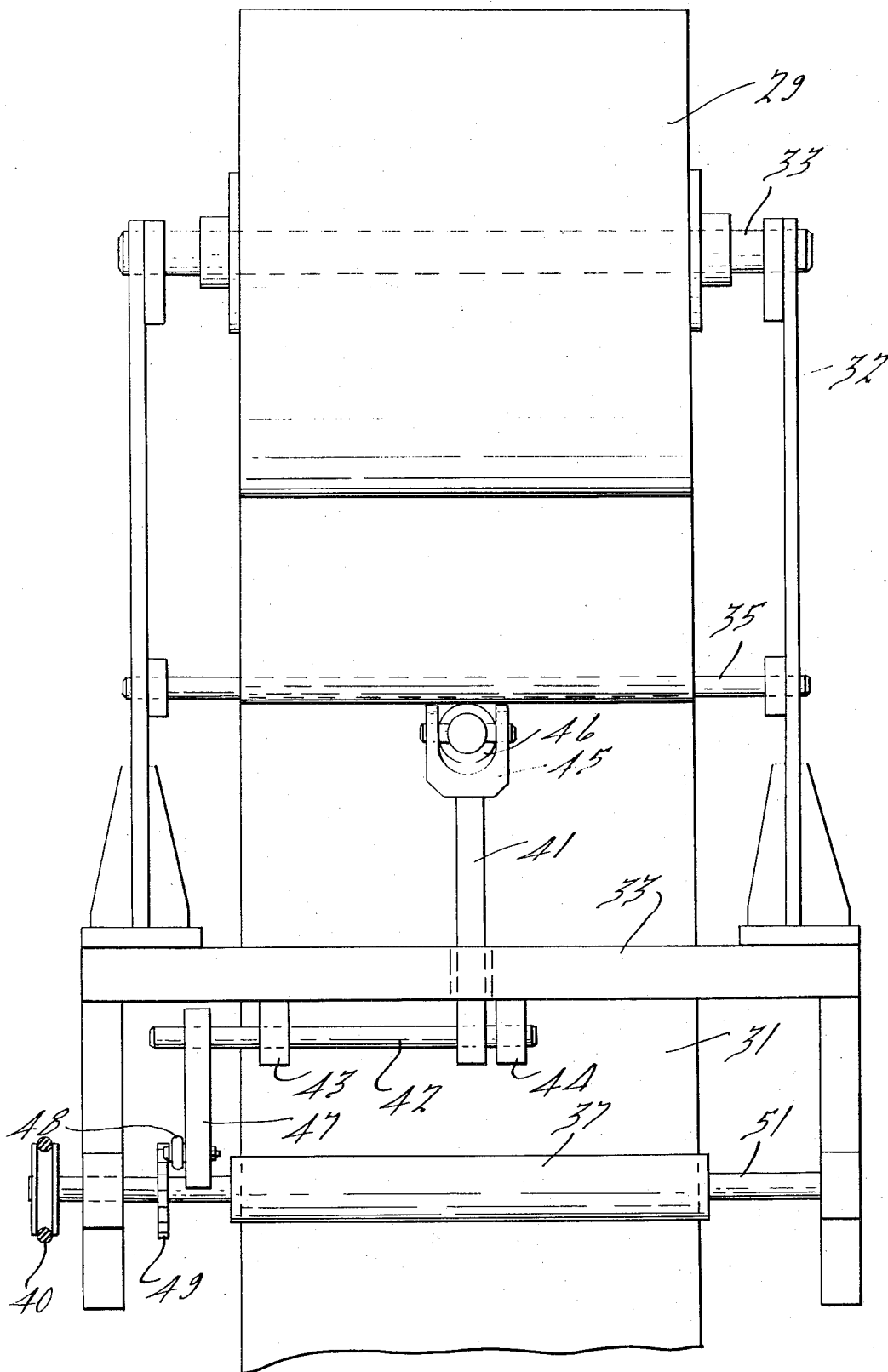


FIG. 2.

PAPER DRILLING MACHINE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to the drilling of holes in stacks of paper sheets such as are used to form loose-leaf or wire-bound notebooks.

2. Description of the Prior Art

It is known to have drilling machines for forming the holes in such stacks, in which the stacks are fed while in upright position to a station between a head which carries reciprocable drills, and a clamp. The clamp is advanced against the stack and is provided with a wooden backup block. The drills are driven through the stack and into the backup block.

Through the course of many cycles, the holes in the wooden backup block become enlarged and as a result the machine tends to form ragged edges in the last sheet of each stack so that this sheet must be discarded. The result is an increase in labor and material costs.

BRIEF SUMMARY OF THE INVENTION

It is an object of the invention to provide a novel and improved means of drilling holes in stacks of sheets which preserves the advantages of the wooden backup block but prevents ragged edges from being formed on the last sheet of each stack by the drills, regardless of the number of cycles and degree of enlargement of the wooden backup block holes.

It is another object to provide an improved paper sheet drilling machine of this type which is reliable in operation and both inexpensive and easy to maintain.

Briefly, the invention comprises a roll of paper which is mounted above the conventional machine and is fed between the backup block and sheet stacks, and thence to a takeup roll. Means are provided for moving this paper in small increments past the location of the backup holes in the wooden block in response to each opening movement of the clamp. When the clamp moves to its clamping position the paper will be pressed between the wooden block and the stack, and the drills will pass through the paper into the holes in the wooden backup block. Any ragged edges which are formed due to enlargement of the backup block holes will be in the paper from the roll and not in any of the sheets in the stack.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of a portion of a stack drilling machine showing the paper rolls of this invention mounted thereon; and

FIG. 2 is a rear elevational view of a portion of the machine taken in the direction of the arrow 2 of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The machine is generally indicated at 11 and comprises a stationary member 12 having a vertical surface 13 against which the lower portions of stacks 14 are pressed when they are being drilled. A row of drills 15 on parallel horizontal axes pass through member 12 and are mounted for simultaneous reciprocating movement from a leftward retracted position toward a drilling position in which they penetrate the lower portion of stack 14. Pusher means 16 are provided for moving

successive stacks 14 into position for drilling along a platform 17, this movement being out of the paper in FIG. 1.

After each stack is moved into drilling position, it is clamped against surface 13 by a backup member 18. This member is mounted for reciprocating horizontal movement between a rightward retracted position and a clamping position as shown in FIG. 1. The means for actuating member 18 comprises a reciprocating fluid motor 19 pivotally mounted at 21 on a bracket 22. Piston rod 23 of this motor is connected by toggle links 24, 25 to member 18, the latter being supported by guide means 26.

A wooden backup block 27 is mounted on the forward end of member 18 and, were it not for the intervening paper backup of this invention, would ordinarily press directly against the lower end of each stack 14 to force it against surface 13. Drills 15 would then advance through the stack and into block 27. After many cycles, the holes in the block would become enlarged and the result would be ragged edges in the holes formed on the last sheet 28 of stack 14.

According to the invention, a roll 29 of paper 31 is rotatably mounted on a bracket 32 extending above frame 33 which supports the main components of the machine. This roll has an axle 33' rotatable in notches 34 of brackets 32. The paper used may be of any suitable type which is relatively inexpensive. Merely by way of example, the paper could be wrapping paper of the proper width to extend past all drills 15 and approximately 0.006 inch thick.

The paper is fed from roll 29 around a guide roll 35 to a guide 36 immediately above block 27. The paper passes across the face of block 27 and around stack support 17. From there the paper is fed around a roll 37 mounted beneath the drilling station to a takeup roll 38 carried by brackets 39 beneath frame 33 and driven by a friction belt 40. The paper thus has a C-shaped path around block 27.

The means for advancing paper 31 between each drilling operation comprises a lever 41 secured to a shaft 42 which is rotatably supported by bearings 43 and 44 beneath frame 33. The upper end of this lever has a yoke 45 engaging a slot 46 in member 18 so that shaft 42 will rock clockwise in FIG. 1 each time member 18 is retracted to the right. An arm 47 secured to the outer end of shaft 42 carries a pawl 48 engageable with a one-way ratchet 49 secured to a shaft 51 which carries roller 37 and also drives belt 40. A counterpressure roller 52 presses paper 31 against roller 37 so that each counterclockwise rotation of the latter by pawl 48 will index the paper one increment. The distance advanced may be varied to suit requirements, it being only necessary to withdraw the previously drilled holes in the paper from the vicinity of the holes formed in block 27. Upon advancement of member 18, pawl 48 will be withdrawn to the right in FIG. 1 to engage the next tooth of ratchet 49.

In operation, stacks 14 will be successively advanced into position for clamping by block 27. Assuming an initial position of the parts as shown in FIG. 1, with drills 15 having advanced through their full stroke, the next step will be for drills 15 to be retracted to the left. Member 18 will then be retracted to the right by motor 19 so that stack 14 may be advanced by pusher 16 and the next stack moved into position for drilling. As member 18 moves to the right pawl 48 will cause paper

31 to advance so that an undrilled portion of the paper will overlap the holes in backup block 27. In a typical installation, an indexing movement of 3/4 inch will be sufficient for paper 31. Takeup roll 38 will also be advanced at this time.

After the new stack 14 is placed in position, member 18 will advance and clamp the lower portion of the stack against surface 13 of member 12, paper 31 being captured between block 27 and sheet 28 of the stack. Drills 15 will then advance, forming holes in the stack and passing therethrough and through paper 31 to block 27. Assuming the holes in the block are enlarged during the course of many cycles, ragged edges may be formed in the holes of paper 31. However, the presence of paper 31 will insure that the holes of all sheets in stack 14, including the last sheet 28, are perfectly formed.

I claim:

1. In a drilling machine for forming a row of holes in the edges of paper stacks, said row having a predetermined length, a stationary member having an elongated surface against which an edge portion of the stack is to be directly clamped, a row of drills guided in said stationary member for movement between a retracted position and a position passing through said elongated surface and penetrating all the sheets, a movable member carrying an elongated wooden backup block and reciprocable between a retracted position and a position in which said block is forced against said edge portion of the stack and said edge portion directly engages said stationary member, said drills entering backup holes in said block after it has passed through the sheets, and means for preventing the formation of a ragged hole edge on the last sheet of the stack engaging said block due to undue enlargement of said backup

holes, said means comprising a supply of paper having a width greater than said predetermined row length, mounting means for said paper supply adjacent said members and spaced therefrom in a direction perpendicular to the extent of said row of holes, a paper-storing takeup roll mounted adjacent said members on the opposite side thereof from said paper supply mounting means, means guiding said paper in said perpendicular direction through the space between said block and said last sheet and thence to said takeup roll, means for indexing said paper in increments in response to retraction of said movable member so that an undrilled portion of the paper will overlap said backup holes, whereby any ragged edges will be formed in said indexable paper rather than in said last sheet, said indexing means comprising a one-way clutch connected to a guide roll for said paper past the location of said drills, a lever interconnecting said one-way clutch with said movable member, and driving means interconnecting said guide roll and take-up roll, whereby retraction of said movable member will advance said paper.

2. The combination according to claim 1, said indexing means comprising a one-way clutch connected to a guide roll for said paper past the location of said drills, a lever interconnecting said one-way clutch with said movable member, and driving means interconnecting said guide roll and takeup roll, whereby retraction of said movable member will advance said paper.

3. The combination according to claim 1, said guide means comprising a first guide roller before said drilling location and a platform on which said stacks rest, whereby said paper will have a C-shaped path around said wooden block.

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