United States Patent

Pugh

[15] **3,640,481**

[45] **Feb. 8, 1972**

[54] MULTIPLE BELT PUNCH

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[52] **U.S. Cl.**.....**242/56.8,** 83/214, 83/249, 226/199, 234/129, 242/67.3, 242/76, 242/156.2

[51] **Int. Cl.**.....**B65h 35/02**

[58] **Field of Search**.....242/55, 56, 56.2, 56.8, 67.1, 242/67.2, 67.3, 67.4, 75.3, 76, 78.6; 226/138, 199; 83/214, 249, 445; 234/129

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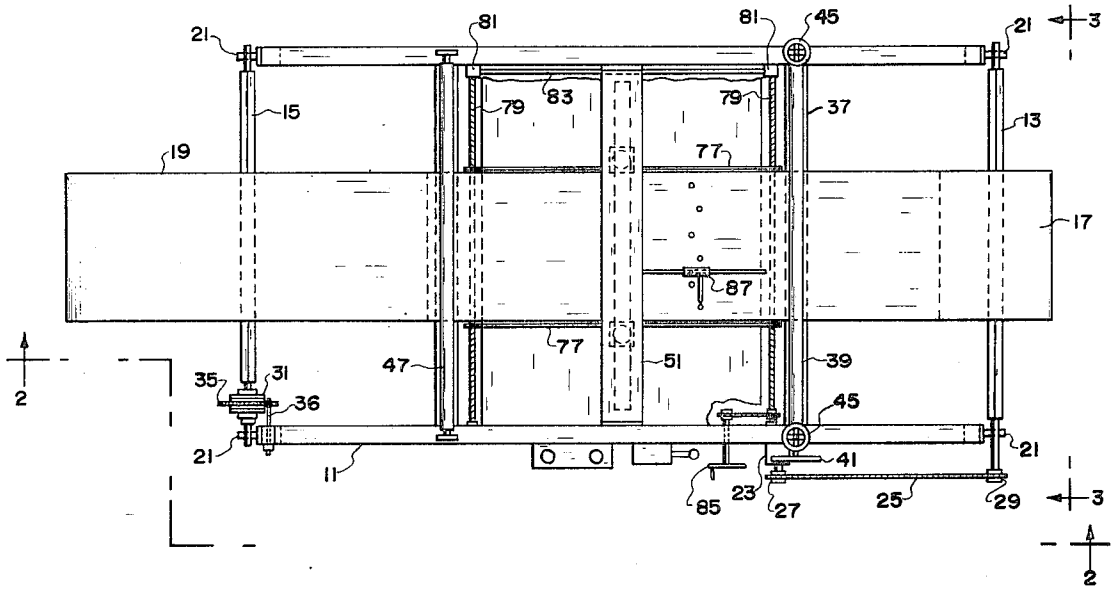
[57] **ABSTRACT**

A worktable for supporting rolls of belting at each end thereof and having a set of reciprocating punches mounted over the table for perforating the belting as it is transferred from one roll to the other.

8 Claims, 6 Drawing Figures



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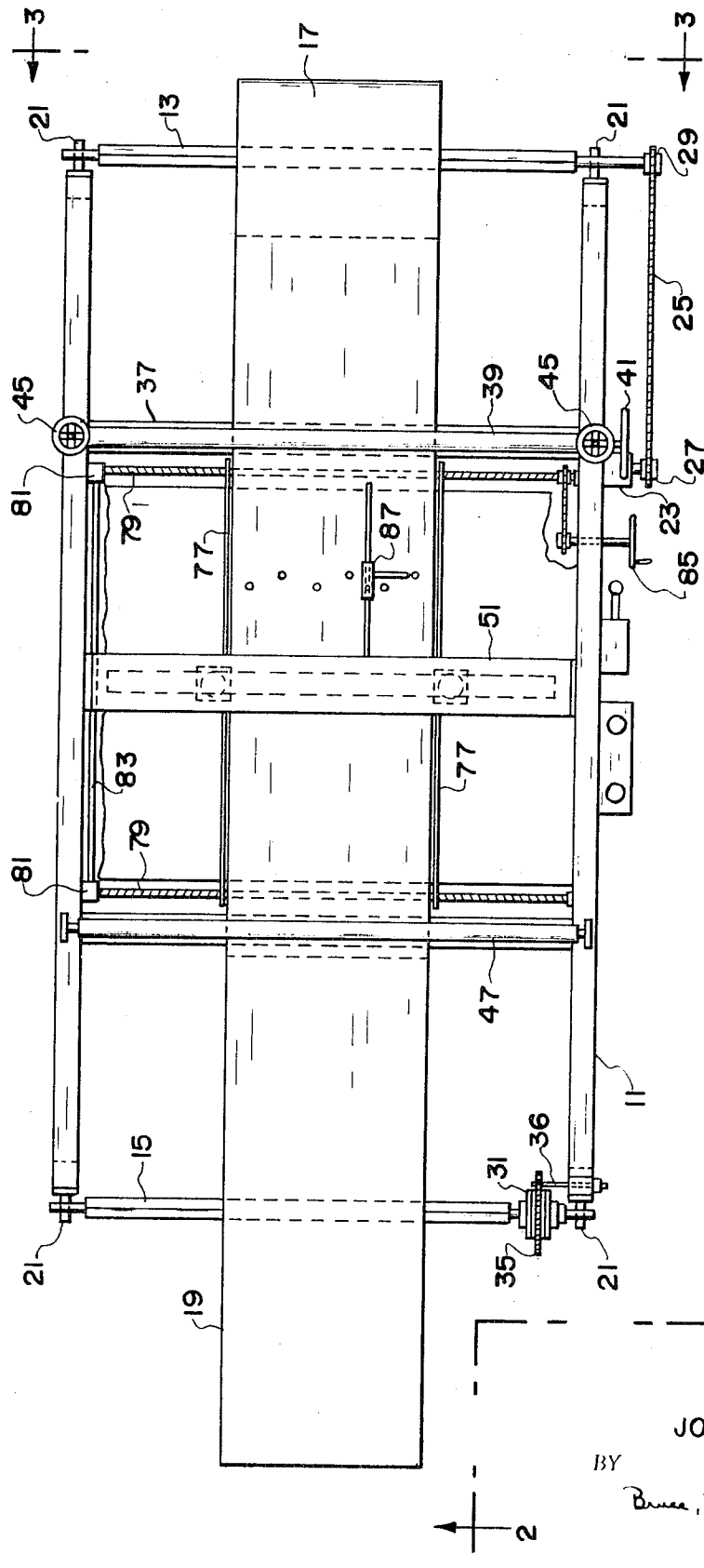

Fig-1

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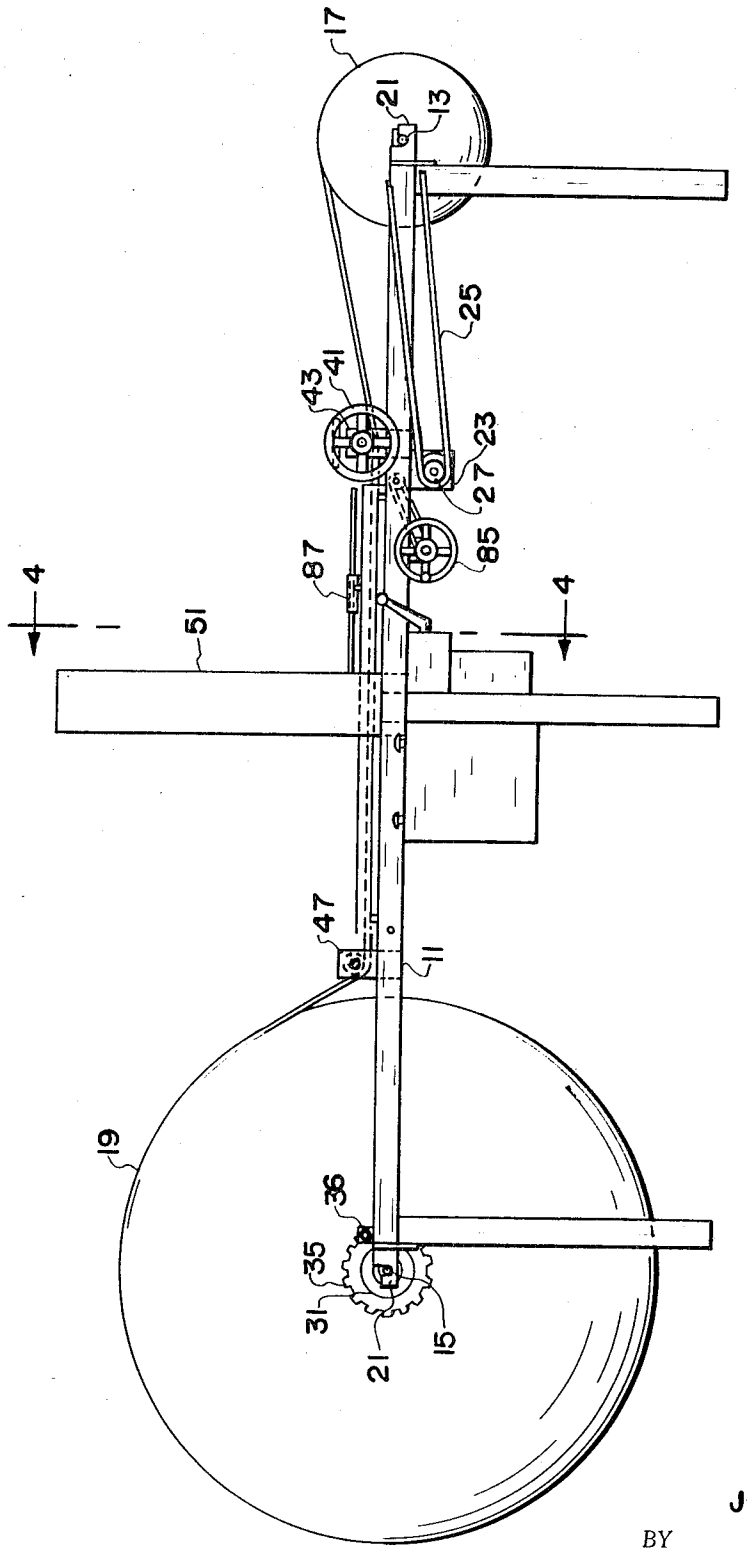

FIG. 2

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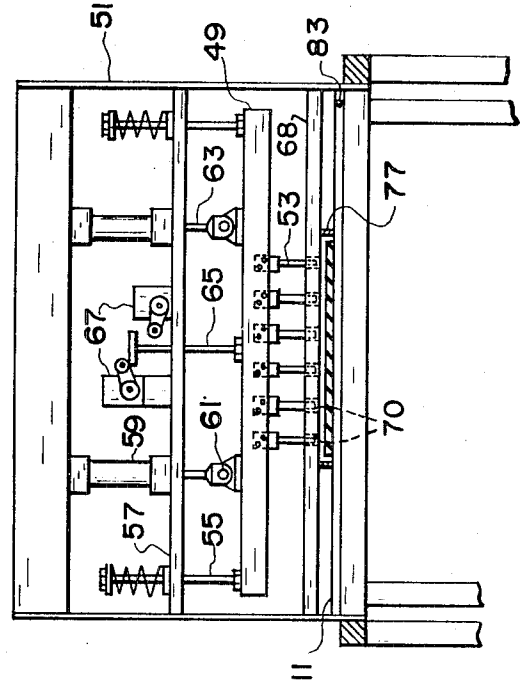

FIG-4

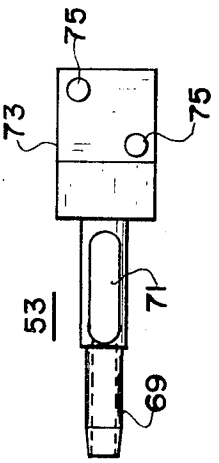

FIG-5

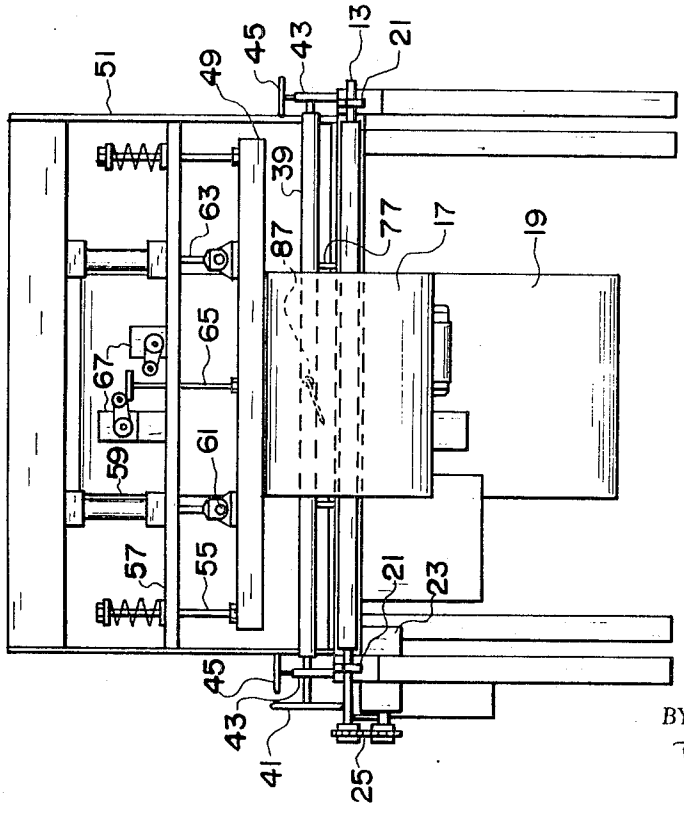

FIG-3

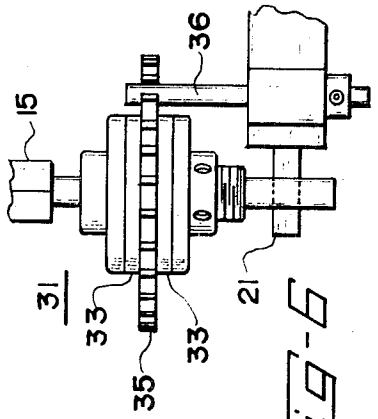

FIG-6

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MULTIPLE BELT PUNCH

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to means for perforating rubber conveyor belting and more particularly to a multiple belt punch which can perforate belting stock with a multiplicity of regularly spaced holes.

2. Description of the Prior Art

When flexible flat conveyor belts, which are used for moving various types of materials, are suitably modified, they are also capable of being utilized as elevators to lift materials for various purposes, such as into storage bins or to the top of a processing machine. Such elevator conveyors generally can be made from the same wide selection of sizes and types of conveyor belting material that flat belt conveyors are made from. Buckets, or steps, or other materials handling means are secured to the surface of the belt to prevent material from sliding down the elevator incline or rise. The most common and effective method of securing buckets to the conveyor belting is simply to perforate the belting and secure the buckets thereto by means of bolts.

Thus, when an elevator conveyor belt is manufactured for a customer, it is necessary for the supplier to perforate the conveyor belting stock in a regular pattern in order to secure the buckets to the belting at the selected interval.

Until the invention of the device described herein, elevator conveyor belts were perforated by hand. The belting was laid out on long tables; a temporary hole pattern was made; the belting stock was marked where the holes were to be placed; and then each hole was hand punched by a hand-held punch and hammer. This required a workman to spend a considerable period of time just in placing the heavy belting on the tables, laying out on the belting the hole pattern, and then to hand punch each individual hole along the belting. This is still the most common way elevator conveyor belts are made at present.

A problem with this method is that the holes must be accurately punched so that undue stress and tearing does not occur in the belt due to misalignment of the securing bolts with the bucket holes.

SUMMARY OF THE INVENTION

The present invention is a multiple belt punch for accurate regular perforating of belting stock. It comprises a worktable having rotatable belt roll support bars disposed at each end thereof for supporting takeoff and takeup belt rolls of belting stock in a position to permit belting to extend between the rolls and to pass over the worktable. A reciprocating punch bar is mounted over the table and has a multiplicity of belt punches removable secured thereto.

In operation, the belting moves from one roll at one end of the table to the other roll at the other end in measured increments across the surface of the worktable. The reciprocating punch simultaneously and accurately punches in one stroke all of the holes required for securing a single bucket to the belting, at measured positions along the belting, as it moves across the worktable.

DESCRIPTION OF THE DRAWINGS

FIG. 1 of the drawings is a top plan view of preferred embodiment of the present invention;

FIG. 2 is a side elevation thereof;

FIG. 3 is an end view thereof;

FIG. 4 is a sectional view taken along lines 4—4 of FIG. 2;

FIG. 5 is an elevational view of a punch as used in the present invention; and

FIG. 6, is a top plan view of a torque limiter.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Reference is made to the drawings for a description of a preferred embodiment of the invention. There shown is a

worktable 11 having a pair of belt roll support bars 13, 15 disposed at opposite ends of the worktable for supporting takeup and takeoff rolls 17, 19. The support bars are journaled in cantilevered half-bearings 21 whereby the support bars can be easily placed in or removed from the bearing journals by vertical movement. The support bars include engagement means for interlocking the belt rolls therewith whereby the rolls rotate with the support bars. In the preferred embodiment, the support bars include a square section along their length which engages a square hole in the ends of the cylinders on which the belting is rolled. The support bars can thereby be removed from the belting roll and a multiplicity of belting rolls or a single longer belting roll stored on a single longer support bar.

A drive means is provided for rotating at least the first support bar 13 on the discharge end of the worktable in order to wind the belting onto a takeup roll 17. The drive means can include a hydraulic, electric, or other type motor 23. In the preferred embodiment, the motor is secured to the bottom of the worktable and mechanically interconnected with the support bar by a chain drive 25 including sprockets 27, 29 mounted on both the motor and the support bar. The drive means selectively advances the belting along the table from the takeoff roll onto the takeup roll.

A variable speed control for the motor means is employed to permit a variable range of rotational speeds of the first support bar. This is necessary to permit accurate selective advancement of the belting along the worktable because as the size of the takeup roll varies, the speed of belting across the table changes greatly with the same rotational speeds of the takeup roll support bar. Slow movement is necessary to prevent overrun while the speeds should also be fast enough to simply wind one roll onto the other at a reasonable rate of rewinding.

A rotational drag means is engaged with the second support bar to prevent overrunning of the takeoff roll as belting is pulled from it by the rotation of the first support bar. In the preferred embodiment, an adjustable torque limiter 31 is secured to the second support bar 15; however, other means such as a hydraulic drag or a brake could be employed.

The torque limiter employs a pair of adjustable disc brakes 33 which clamp on opposite sides of a sprocket 35 which is journaled on the support shaft. The brakes are engaged with the shaft. A slidable pin 36 is mounted on the worktable and can lock the sprocket to activate or inactivate the drag means. When the pin engages the sprocket to lock it against rotation, the torque limiter is operative, and as the brakes are tightened against the sprocket, friction is increased on the support bar to prevent it from turning. To inactivate the torque limiter, the pin is slid out of engagement with the sprocket.

The preferred embodiment includes a manual belt advance means disposed on the takeup roll end of the worktable for incremental movement of the belting along the worktable. This is for accurate minute longitudinal positioning of the belting along the table which cannot be accomplished by the drive means rotating the first support bar. The manual advance includes a pair of parallel rollers 37, 39 mounted across the top of the worktable between which the belting passes in travelling along the table from the takeoff roll to the takeup roll. The spacing between the rollers is adjustable to permit frictional engagement of the belting by the rollers.

At least one of the rollers has a handwheel 41 secured thereto to permit manual rotation of said rollers to move said belting and thereby permit incremental movement of the belting either forward or backward along the table.

The particular arrangement of the two rollers has the lower roller 37 disposed generally below the worktable whereby the top of the roller is level with the top of the table. The upper roller 39 is movable with respect to the lower roller to permit different thickness belting to be gripped between the rollers. The handwheel 41 is secured to the upper roller 39. The journal blocks for the upper roller are movable mounted in vertical slides 43. A pair of hand screws 45 are threaded into the

slides and engage the journal blocks with a rotatable connection whereby the journal blocks, and thereby the roller, can be raised or lowered in the slides by turning the hand screws.

A holddown roller **47** is mounted across the top of the table at the other end of the table from he manual belt advance rollers proximate the takeoff roll. The belting from the takeoff roll passes under this roller whereby it is held flat on the worktable. The manual belt advance rollers provide the same effect to the belt at the other end of the table.

A hydraulically powered vertically reciprocating punch bar **49** is mounted over the worktable in a frame **51** secured to the table. The punch bar has a multiplicity of belt punches **53** which are removably secured thereto whereby different punch patterns can be effected through changing the arrangement and number of punches mounted on the punch bar. The ends of the bar are engaged with a pair of spring-loaded guide rods **55** which pass through a structural member **57** in the frame. The punch bar is reciprocated by a pair of hydraulic cylinders **59** which have pin connections **61** with the bar to prevent stresses being imposed on the connecting rods **63** of the cylinders if unequal operation occurs. A push rod **65** is mounted on the bar to activate limit switches **67** mounted on the structural member. The switches limit the stroke of the cylinders.

A stripper bar **68** having a plurality of holes **70** through which the punches **53** pass is fixed at its ends in the frame **51**. As shown in FIG. **4**, the stripper bar extends across the worktable and stops the belting which has been punched from following up with the punches when they are retracted. It normally takes considerable pull to remove a punch from the thick belting. The stripper bar **68** is fixed to the frame **51**, so that the punches are pulled up by the power head, the stripper bar holds the belt down to allow the punches to be pulled out and up.

FIG. **5** shows one of the individual belt punches of the type which is secured to the punch bar. A sharpened tubular lower end **69** on the punching member perforates the belting. The plugs punched from the belting move up through the interior of the punch shaft and are discharged through the elongated opening **71** in the side of the punching member. The bases **73** of the punches are removably secured to the punch bar by conventional mechanical attachment means.

Control means are provided at the side of the worktable, proximate the handwheel of the manual belt advance rollers, for actuating the hydraulic cylinders which power the punch bar and for operating the motors which rotate the takeup roll and the first support bar.

An adjustable guide means is provided for centering different widths of belting under the punch bar. The guide means includes a pair of parallel plates **77** mounted on opposite sides of and adjacent the path the belting travels across the worktable. The plates engage at least one threaded shaft having opposite threads on each end thereof whereby rotation of the threaded shaft in a first direction moves said plates either toward or away from each other and reverse rotation of the shafts moves the plates in the opposite direction. The plates are disposed equidistant from and on opposite sides of the centerline of the punch bar disposed perpendicular thereto.

In the preferred embodiment, a pair of parallel threaded shafts (**79**) are journaled in the worktable and are mechanically interconnected for equal angular rotation. This interconnection includes a pair of right angle drives **81** at each end of the two shafts and an interconnecting drive shaft **83**. The threaded shafts have opposite threads on each end thereof, and both of the shafts are rotatable by a single manually operable handwheel **85** which is also disposed at the side of the worktable proximate the punch bar control and the manual advance handwheel.

The guide plates engage the respective ends of the two threaded shafts **79** which are journaled in the worktable. The shafts are coordinated whereby as they are rotated in a first direction, the plates move either toward or away from each other and reverse rotation of the shafts moves the plates in the opposite direction. The plates are initially disposed an equal distance from the center of the punch bar whereby as the shafts rotate, the two plates keep an equal distance from the center of the punch bar to keep the belting centered beneath the bar.

An indicator means is provided which is mounted on the belt punch for accurate measurement of the amount of belting passing underneath the punch bar. Many indicators, such as simply a graduated scale along the edge of the guide plates or other graduations mounted on the worktable, would work satisfactorily. In the preferred embodiment, the indicator means includes a pointer **87** which projects from the frame **51** on the worktable accurately locating the spacing between each of the sets of perforations made in the belting by the punch bar. The pointer provides a ready reference over the belting for determining exactly the amount of belting which has passed beneath the punch bar.

In operation, a takeoff belt roll **19** is mounted on the second support bar **15** at one end of the worktable. The belting is pulled off the takeoff roll and fed under the holddown roller **47** which holds the belting flat against the worktable surface. The belting then passes underneath the punch bar **49**, between the rollers **37**, **39** which comprise the manual advance, and is secured to the takeup roll **17** which is engaged with the first belt roll support bar **13**. The guide means handwheel **85** is then turned to close the guide plates **77** and center the belting underneath the punch bar. The hand screws **45** are adjusted to lower the upper roller **39** against the belting. The belting is then advanced by the drive means. If the advancement of the belting under the punch bar by the drive means is not exactly correct, the manual belt advance handwheel **41** can be rotated to turn the roller **39** and move the belting either forward or backward a small amount to accurately position it under the punch bar. The punch bar is then actuated to perforate the belting at the selected intervals.

It will be obvious from the foregoing disclosure that the present invention will fulfill all of the objects attributable thereto.

What is claimed is:

1. A multiple belt punch comprising an elongated flat worktable for supporting heavy belting material, said worktable having first and second belt roll support bars journaled in cantilevered bearings extending from each end thereof for supporting takeup and takeoff belt rolls, respectively, in a position away from said worktable,

engagement means for causing the belt rolls to rotate with the support bars,

drive means for rotating at least said first support bar to pull said supported belting across said worktable and onto a takeup roll carried by said first bar and to selectively advance said supported belting along said table from said second support bar on which the takeoff belt roll is mounted,

rotational drag means engaged with said second support bar to prevent overrunning of said takeoff roll as belting is pulled therefrom by the rotation of said first support bar,

a belt manual advance adjustment means mounted on said worktable for engaging the belting which passes thereover in travelling from the takeoff roll to the takeup roll to permit incremental movement of the belting either forward or backward along said table between said rolls,

a reciprocating punch bar mounted over and supported by said table and having a multiplicity of belt punches removably secured thereto whereby a plurality of holes may be simultaneously punched in said belting, and

an adjustable means for centering different widths of belting supported on said flat worktable under said punch bar.

2. The multiple belt punch of claim **1** wherein said drive means includes a variable speed control to permit a variable range of rotational speeds of said first support bar.

3. The multiple belt punch of claim **1** wherein said rotational drag means is an adjustable torque limiter which is secured to said second support bar and selectively engageable to activate or inactivate said drag means.

4. The multiple belt punch of claim 1 wherein said guide means includes a pair of parallel guide plates mounted on opposite sides and adjacent the path belting travels across the worktable, said plates engaging opposite ends of at least one threaded shaft having opposite threads on each end thereof whereby rotation of said threaded shaft in a first direction moves said plates either toward or away from each other and reverse rotation of said shaft moves said plates in the opposite direction, said plates being continuously equidistant to the perpendicular center line of said punch bar on opposite sides thereof.

5. The multiple belt punch of claim 4 wherein said guide means further includes a pair of parallel threaded shafts mechanically interconnected for equal angular rotation and disposed transverse to said guide plates, each of said shafts having opposite threads on each end thereof engaging said guide plates, said shafts being rotatable by a single manual handwheel operable by the belt punch operator.

6. The multiple belt punch of claim 1 wherein said manual advance adjustment means includes a pair of parallel rollers mounted on said worktable and between which the belting passes, said rollers being adjustable toward and away from each other to permit frictional engagement of said belting, and at least one of said rollers having a handwheel secured thereto to permit manual rotation of said rollers to move said belting.

7. A multiple belt punch comprising

a worktable having first and second belt roll support bars journaled at each end thereof for supporting takeup and takeoff belt rolls, respectively,

engagement means for causing the belt rolls to rotate with the support bars,

a motor means engaged with said first support bar to wind said belting onto said bar into a takeup roll,

variable speed control for said motor means to permit a variable range of rotational speeds of said first support bar and to permit selective advancement of said belting along said worktable from said second support bar on which the takeoff belt roll is mounted,

an adjustable torque limiter secured to said second support bar to prevent overrunnning of said takeoff roll as belting is pulled therefrom by the rotation of said first support bar, said limiter being selectively engageable with said worktable to activate or inactivate said drag means,

a pair of parallel rollers mounted on said worktable and between which the belting passes in travelling from the takeoff roll to the takeup roll, said rollers being adjustable toward and away from each other to permit frictional engagement of said belting, said rollers mechanically interconnected to a manually operable handwheel for rotation of said rollers to permit incremental movement of said belting either forward or backward along said table between said rolls, said handwheel operable by the belt punch operator,

a hydraulically powered vertically reciprocating punch bar mounted over said worktable in a frame secured to said worktable, said punch bar having a multiplicity of belt punches removably secured thereto,

control means for activating the punch bar operable by said belt punch operator,

a pair of parallel threaded shafts journaled in said worktable and mechanically interconnected for equal angular rotation, said shafts having opposite threads on each end thereof and being rotatable by a single manually operable handwheel operable by the belt punch operator,

a pair of parallel guide plates mounted on opposite sides and adjacent the path the belting travels across the worktable, said plates engaging the threaded shafts whereby as said shafts are rotated in a first direction said plates move either toward or away from each other and reverse rotation of said shafts moves said plates in the opposite direction, said plates being initially disposed equal distances on opposite sides of the perpendicular centerline of said punch bar, and

indicator means mounted on said belt punch for accurate measurement of the amount of belt passing under said punch bar.

8. The multiple belt punch of claim 1 including a stripper bar secured to said table above said belting, said stripper bar having a plurality of holes formed therein through which said belt punches pass, whereby said punches may be pulled from said belting upon withdrawal of said punch bar after said holes have been punched.

* * * * *

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,640,481 Dated February 8, 1972

Inventor(s) JOHN G. PUGH

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, line 53, change "removably" to -- removable --;

Column 2, line 74, change "moveable" to -- movably --;

Column 3, line 5, after "from" change "he" to -- the --;

Column 4, line 67, in claim 1, after "adjustable" insert

-- guide --;

Column 5, line 9, in claim 7, change "continuously" to

-- continually --.

Signed and sealed this 25th day of July 1972.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents

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