

Sept. 6, 1960

W. W. WOODBURY ET AL

2,951,534

HIGH SPEED PUNCH

Filed March 1, 1957

3 Sheets-Sheet 1

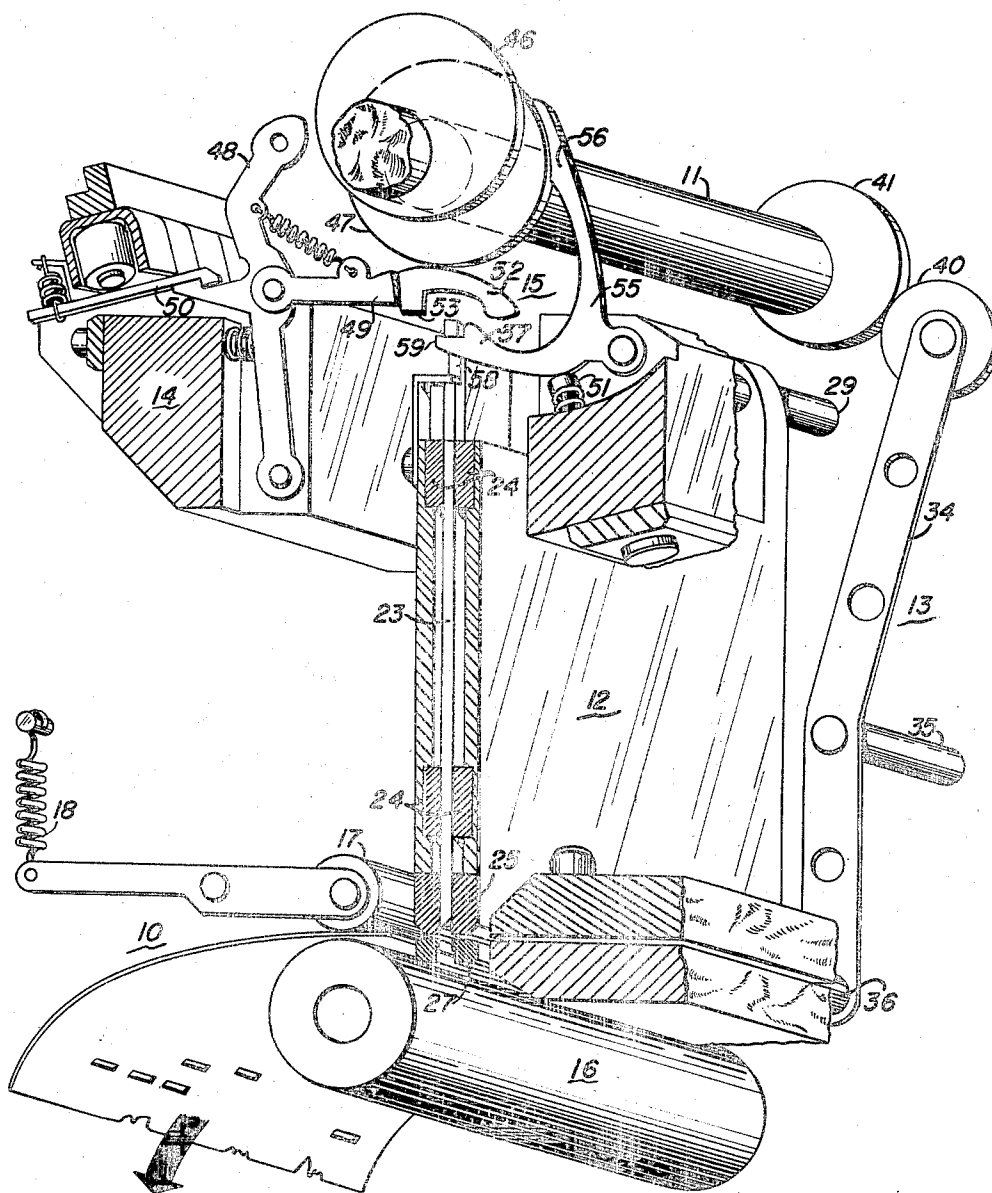


FIG. 1

INVENTOR.
WILLIAM W. WOODBURY
NORMAN A. VOGEL
BY
GREGORY J. TOBEN
Richard C. Cummins
ATTORNEY

Sept. 6, 1960

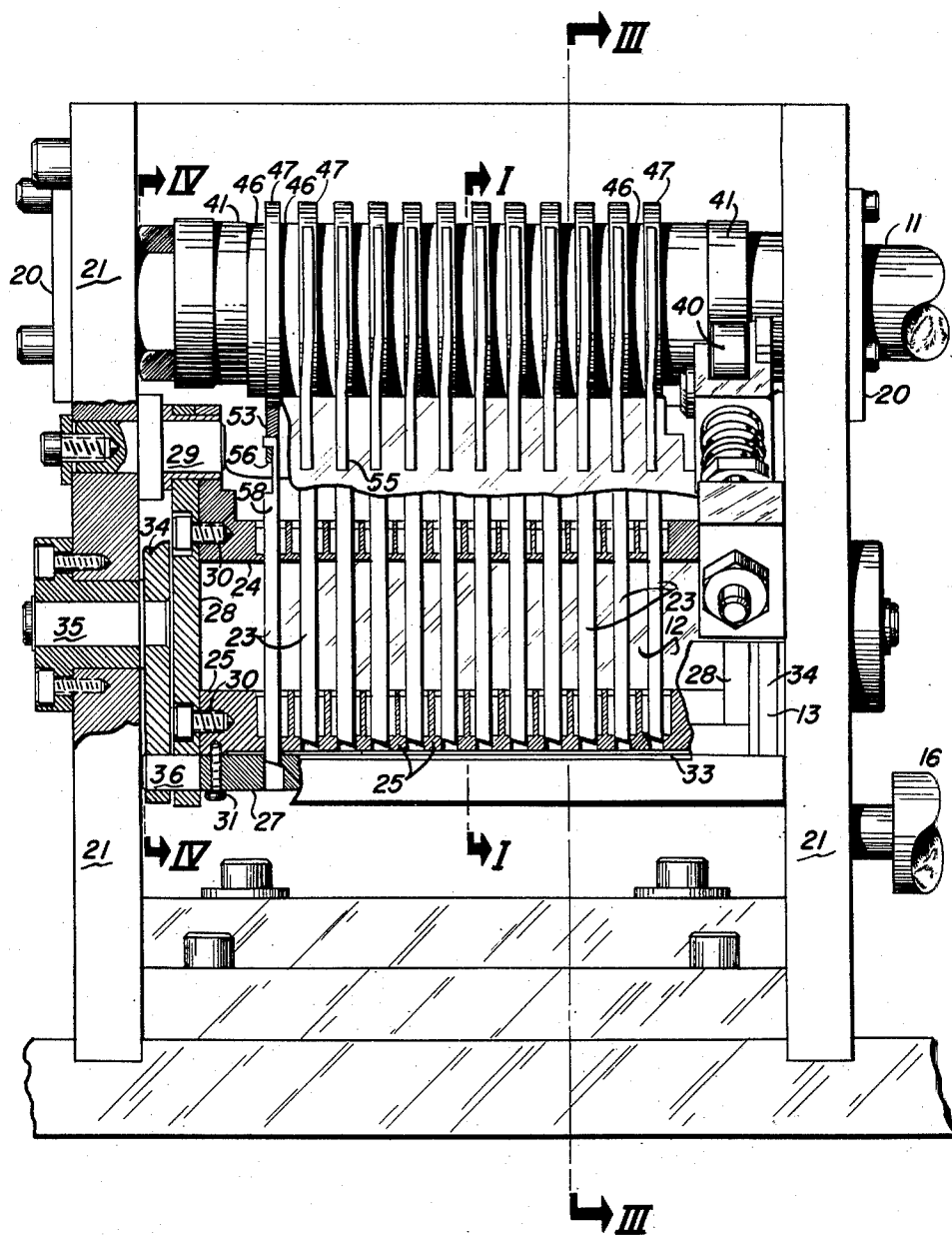
W. W. WOODBURY ET AL

2,951,534

HIGH SPEED PUNCH

Filed March 1, 1957

3 Sheets-Sheet 2



Sept. 6, 1960

W. W. WOODBURY ET AL

2,951,534

HIGH SPEED PUNCH

Filed March 1, 1957

3 Sheets-Sheet 3

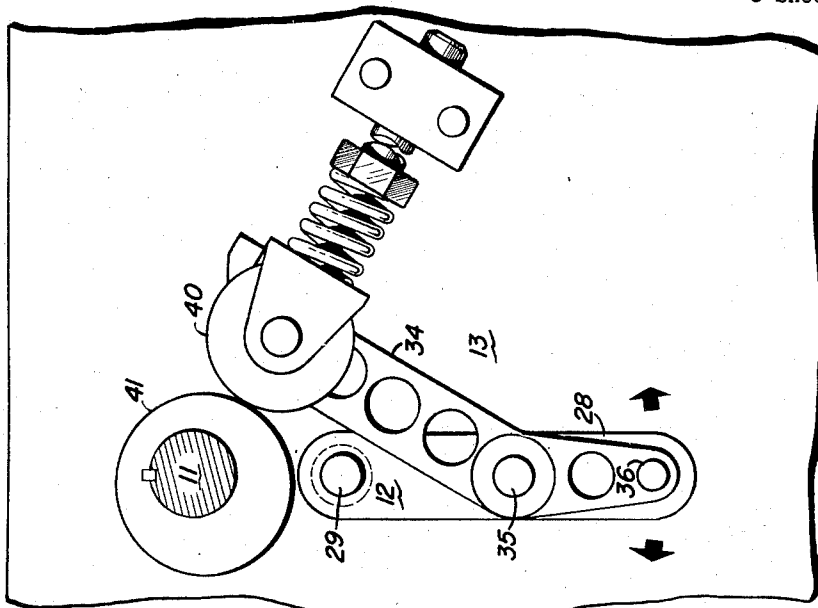


FIG. 4

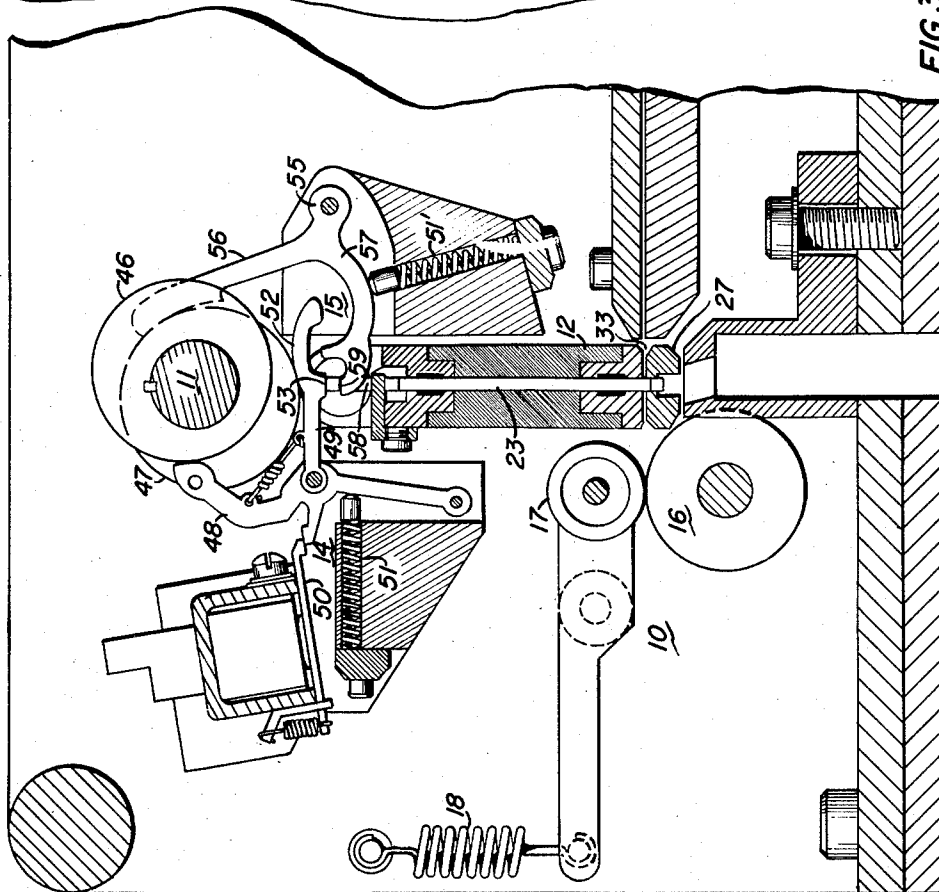


FIG. 3

1

2,951,534

HIGH SPEED PUNCH

William W. Woodbury, San Jose, Gregory J. Toben, Mountain View, and Norman A. Vogel, Palo Alto, Calif., assignors to International Business Machines Corporation, New York, N.Y., a corporation of New York

Filed Mar. 1, 1957, Ser. No. 643,302

4 Claims. (Cl. 164—111)

This invention relates in general to mechanisms for storing data by providing punched openings in cards, and in particular to a mechanism of the type wherein the punching operation occurs as the card is moved continuously through the punching station.

In order to increase the speed at which punched openings may be provided in record cards and the like, the prior art has suggested moving the punch members in synchronism with the card during the punching operation. Card punching machines of this type, commonly referred to in the art as swinging die punches, have in the past required relatively complex mechanical arrangements for controlling the movement of the individual punch members simultaneously with the movement of the swinging die. While prior art card punches of this type are capable of operating at speeds greater than mechanisms in which the punch members are not moved with the card, their speed has been limited to a great extent by the arrangements employed for controlling the synchronous movements of the various parts of the mechanism.

In accordance with the present invention a high speed card punch mechanism is provided with a punch assembly having a plurality of individually selectable punch members movable in synchronism with the card being punched during the punching operation, in which the movements of the punch assembly and the individual punch members are controlled by means of a relatively simple mechanical arrangement including only one shaft.

An object of the present invention, therefore, is to provide an improved high speed card punching machine.

Another object of the present invention is to provide an improved card punching mechanism in which the punch members are moved in synchronism with the card during a punching operation.

A further object of the present invention is to provide a mechanically simple arrangement for moving a plurality of punch members in synchronism with a card during a punching operation and for selectively operating the individual punch members.

A still further object of the present invention is to reduce the number of mechanical elements employed in high speed card punch machines.

A still further object of the present invention is to provide a card punching mechanism in which only one cam shaft is employed to control the synchronous movements of a swinging die and a plurality of punch members.

Other objects of the invention will be pointed out in the following description and claims and illustrated in the accompanying drawings, which disclose, by way of example, the principle of the invention and the best mode which has been contemplated of applying that principle.

In the drawings:

Fig. 1 is a sectional perspective view of the high speed punch shown in Fig. 2, taken along the line I—I.

Fig. 2 is a front view in elevation, partly in broken section, illustrating a high speed card punch mechanism embodying the present invention.

2

Fig. 3 is a sectional view of the punch mechanism taken along the line III—III of Fig. 2.

Fig. 4 is a sectional view of the punch taken along the line IV—IV of Fig. 2.

Referring to the drawings, and particularly to Figs. 1 and 2, the improved, simplified punch mechanism illustrated therein comprises generally suitable means 10 for feeding a record such as a web, a sheet, a card or a tape continuously through a punching station, a shaft 11 mounted for rotation about an axis transversely to the direction of movement of the record and provided with a plurality of cams, a punch assembly 12 including a plurality of punch members mounted for pivotal movement on an axis parallel to the axis of the shaft 11, means 13 responsive to rotation of a first set of cams to control the pivotal movement of the punch assembly, means 14 selectively responsive to rotation of a second set of cams to render the punch members actuatable from one position to another by a third set of cams to provide a punched opening in the record while the record is moving, and means 15 responsive to rotation of the third set of cams to return the actuated punch members to their initial position.

Any suitable feed mechanism 10 may be employed with the present invention provided it is of the type which operates to move the record through the punching station at a constant, predetermined speed. The feed mechanism employed in the embodiment of the invention illustrated in the drawings may be seen by referring to Figs. 1 and 2 wherein the record is a card which is to be fed to a pair of rollers 16 and 17, one of which is biased toward the other by biasing means 18. The rollers 16 and 17 are driven so that the card being punched moves through the punching station at a constant speed from right to left as shown in Figs. 1 and 3.

The punch mechanism includes shaft 11 which, as shown in Fig. 2, is mounted in bearings 20 disposed in side frames 21 so as to rotate about an axis transverse to the direction of movement of the card. Shaft 11 is provided with a plurality of cams which rotate with shaft 11 and function to control the synchronous movements of the punch mechanism.

One movement which is controlled by shaft 11 is the pivotal or oscillating movement of the punch assembly 12. As shown, punch assembly 12 includes a plurality of rod-like punch members 23, a punch guide 24, a die stripper 25, a punch die 27 and a pair of hangers 28 which are pivotally attached to side frames 21 by means of trunnions 29. Punch guide 24 and die stripper 25 are fixedly mounted between hangers 28 by suitable means such as bolts 30. Punch die 27 is attached to die stripper 25 by means of bolts 31 and spaced therefrom so as to define a card receiving slot 33 through which the card being punched is fed by card feeding means 10.

The means 13 employed for moving punch assembly 12, shown in more detail in Fig. 4, includes a pair of bell cranks 34 pivotally mounted on journals 35 disposed in side frames 21 and attached to the punch assembly at one end by portion 36 of punch die 27 which extends through the distal end portions of hangers 28. The other end of each bell crank is provided with a cam follower 40 biased toward and engageable with a pair of cams 41 disposed at opposite ends of the shaft 11. Rotation of cams 41 causes the bell cranks 34 to pivot on journals 35, causing the punch assembly 12 to pivot or swing on trunnions 29 with an oscillating or swinging motion.

The operation of punch members 23 is controlled by a plurality of cams disposed on shaft 11 between swing cams 41. Two sets of cams, referred to as "select" cams and "punch" cams, are provided. The sets are arranged alternately so that successive pairs of cams include one select cam 46 and one punch cam 47 which

function to control the movement of one punch member 23. Since the operation of each of the punch members 23 is similar, only one is described.

With reference to Figs. 1 and 3, the means 14, which is responsive to rotation of select cam 46 to render punch member 23 actuatable by punch cam 47 to provide a punched opening in the card as shown, comprises a pivotally mounted select lever 48, an interposer element 49, and an electromagnetic latch means 50. Select lever 48 is biased toward the select cam 46 by means of a spring 51 which causes select lever 48 to move in accordance with the contour of select cam 46 when the electromagnet of latch means 50 is energized and releases select lever 48. Interposer element 49 has one end pivotally attached to the select lever 48 while the other end 52 is biased to follow punch cam 47. End 52 is positionable between the punch cam 47 and the top of punch member 23 and is provided with a portion 53 which is engageable with the end of punch member 23 when latch means 50 is energized and select lever 48 is released. Portion 53 acts to transmit the force from punch cam 47 to punch member 23 to cause punch member 23 to move downward and provide a punched opening in the moving card. However, when select lever 48 is latched out of position, as shown in Fig. 1, portion 53 of interposer element 49 is not in position to engage punch member 23 and hence a punching operation does not occur.

When punch member 23 is actuated, as shown in Fig. 3, means 15 responsive to rotation of punch cam 47 returns the punch member to its initial position. Means 15, as shown, comprises a pivotally mounted, bifurcated restorer lever 55 having one arm 56 which engages a punch cam 47 and a second arm 57 which engages a notch 58 in punch member 23. Restorer lever 55 is biased by a spring 51' so that end 59 of arm 57 is always in contact with the portion of the punch member 23 which defines the upper end of notch 58.

Select cam 46 and punch cam 47 associated with each punch member 23 are positioned similarly on shaft 11 so that each punch member 23 is moved at the same time when selected. Further, the position of swing cams 41 on shaft 11 with relation to the select cams 46 and punch cams 47 is such that assembly 12 is caused to move at the same rate as the card while punch members 23 perform the punching operation.

It has been found that a punch mechanism embodying the present invention operates satisfactorily at speeds not obtainable by punching mechanisms suggested in the prior art.

While there have been shown and described and pointed out the fundamental novel features of the invention as applied to the preferred embodiment, it will be understood that various omissions and substitutions and changes in the form and details of the device illustrated and in its operation may be made by those skilled in the art without departing from the spirit of the invention. It is the intention, therefore, to be limited only as indicated by the scope of the following claims.

What is claimed is:

1. A mechanism for perforating a continuously moving record comprising in combination a single shaft disposed with its axis transverse to the direction of movement of said record and provided with three sets of cams rotatable by said shaft, a punch assembly including a plurality of punch members mounted for pivotal movement on an

axis parallel to the axis of said shaft, means responsive to rotation of a first set of said cams to cause said pivotal movement, means selectively responsive to rotation of a second set of said cams for rendering said punch members actuatable by said third set of cams to provide punched openings in said record, and means responsive to rotation of said third set of cams to restore said actuated punch members to their initial position.

2. A mechanism for punching openings in a continuously moving web comprising in combination a single shaft disposed with its axis transverse to the direction of movement of said web and provided with three sets of cams rotatable by said shaft, a punch assembly including a plurality of punch members mounted for pivotal movement on an axis parallel to the axis of said shaft, a pair of pivotally mounted bell cranks each having one end connected to said punch assembly and the other end provided with cam followers engageable with and responsive to rotation of said first set of cams for causing said pivotal movement of said punch assembly, means selectively responsive to rotation of a second set of said cams for rendering said punch members actuatable by said third set of cams to provide punched openings in said web, and means responsive to rotation of said third set of cams to restore said actuated punch members to their initial position.

3. A mechanism for punching openings in a continuously moving web comprising in combination a single shaft disposed with its axis transverse to the direction of movement of said web and provided with a plurality of cams, a plurality of punch members mounted for pivotal movement on an axis parallel to the axis of said shaft, means responsive to rotation of certain of said cams to cause said pivotal movement, and means selectively responsive to rotation of said remaining cams to move said punch members substantially normal to said web with a reciprocating motion simultaneously with said pivotal movement to provide a punched opening in said web while said web is moving.

4. A punch mechanism for perforating a moving record element comprising in combination means for moving said element through said mechanism at a substantially constant speed, a plurality of individually selectable punch members, means mounting said punch members for pivotal movement about an axis transverse to the direction of movement of the record element and for reciprocal movement along a path substantially normal to said element, a shaft disposed in parallel spaced relationship to said axis and provided with camming means, means mounted in motion transmitting relationship between said camming means and said punch member mounting means to cause said pivotal movement, and means selectively positionable between said camming means and said punch members to cause selected punch members to be moved along said path whereby said record element is perforated while moving at said constant rate.

References Cited in the file of this patent

UNITED STATES PATENTS

1,677,180	Green et al. _____	July 17, 1928
2,186,884	Shoemaker _____	Jan. 9, 1940
2,423,698	Hallman _____	July 8, 1947
2,746,548	Paris et al. _____	May 22, 1956
2,761,508	Goff _____	Sept. 4, 1956