United States Patent [19]

Thevis et al.

[11] **3,721,186**

[45] **March 20, 1973**

[54] **ROCKABLE IMPRESSION DEVICE FOR A PRINTING MACHINE**

[75] Inventors: **Paul Thevis**, Oberndorf; **Adolf Schneider**, Altoberndorf; **Horst Jakubaschk**, Oberndorf, all of Germany

[73] Assignee: **Olympia Werke AG**, Wilhelmshaven, Germany

[22] Filed: **Jan. 20, 1971**

[21] Appl. No.: **108,104**

[30] **Foreign Application Priority Data**

Feb. 5, 1970 Germany.....P 20 05 143.8

[52] **U.S. Cl.** **101/297**, 101/94, 101/97

[51] **Int. Cl.**.....**B41f 1/04**

[58] **Field of Search**.....101/5, 287, 297, 94, 95, 97

[56] **References Cited**

UNITED STATES PATENTS

2,711,692	6/1955	Root	101/297
2,562,214	7/1951	Root	101/297
3,244,096	4/1966	Riley	101/297
2,309,645	2/1943	Harrington et al.	101/297 X
2,639,665	5/1953	Lambert	101/297 X
3,468,244	9/1969	Yow-Jiun Hu	101/297 X
2,497,800	2/1950	Root	101/297
2,497,798	2/1950	Root	101/297
2,919,644	1/1960	Roessler, Jr.	101/297
3,585,929	6/1971	Gopperton	101/297 X
1,992,542	2/1935	Plushwell	101/287

FOREIGN PATENTS OR APPLICATIONS

171,386	0/1951	Austria	101/297
168,346	0/1950	Austria	101/297

Primary Examiner—Robert E. Pulfrey
Assistant Examiner—Eugene H. Eickholt
Attorney—Michael S. Striker

[57] **ABSTRACT**

An impression device for a parallel printer, in which a row of characters or digits is imprinted by a row of types, has an impression member with a convex curved impression surface rocking on a copy sheet and on an inked ribbon covering the row of types so that imprints of the characters are made. The rocking motion of the impression member is obtained by alternately moving the ends of the same toward and away from the row of types after a frame carrying the impression member, has been rapidly moved to a position in which one end of the impression member abuts the sheet.

10 Claims, 3 Drawing Figures

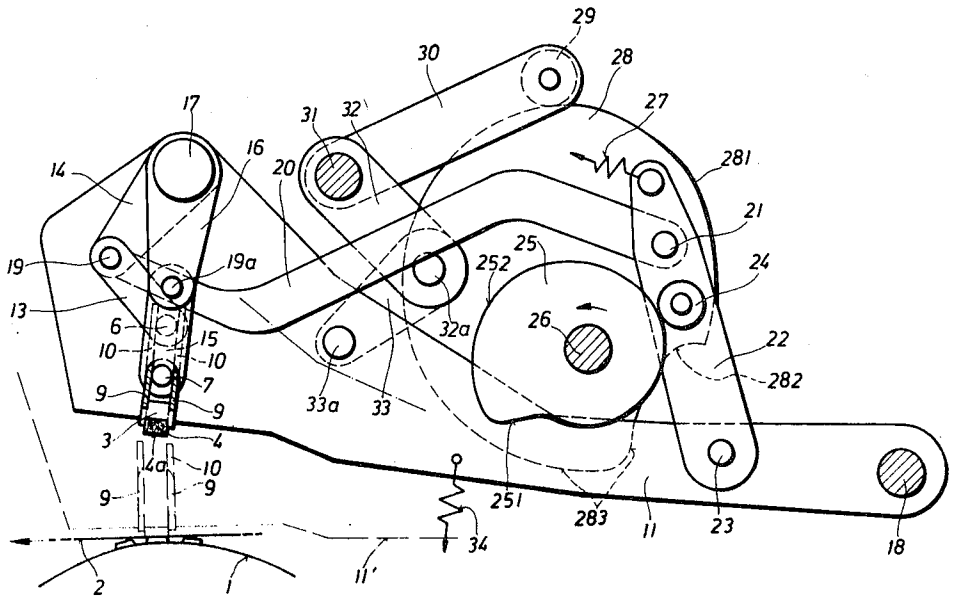
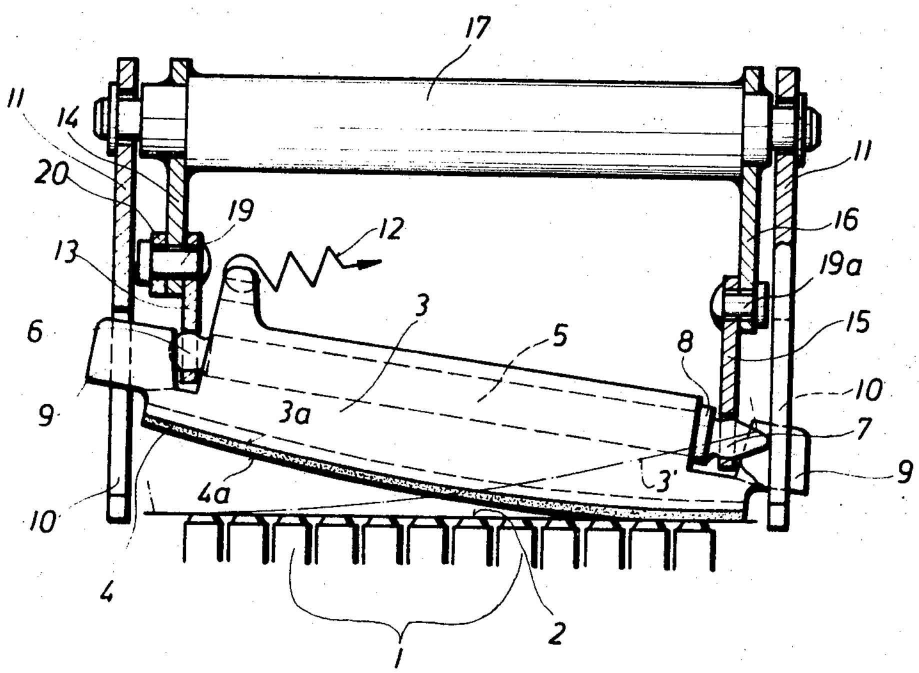


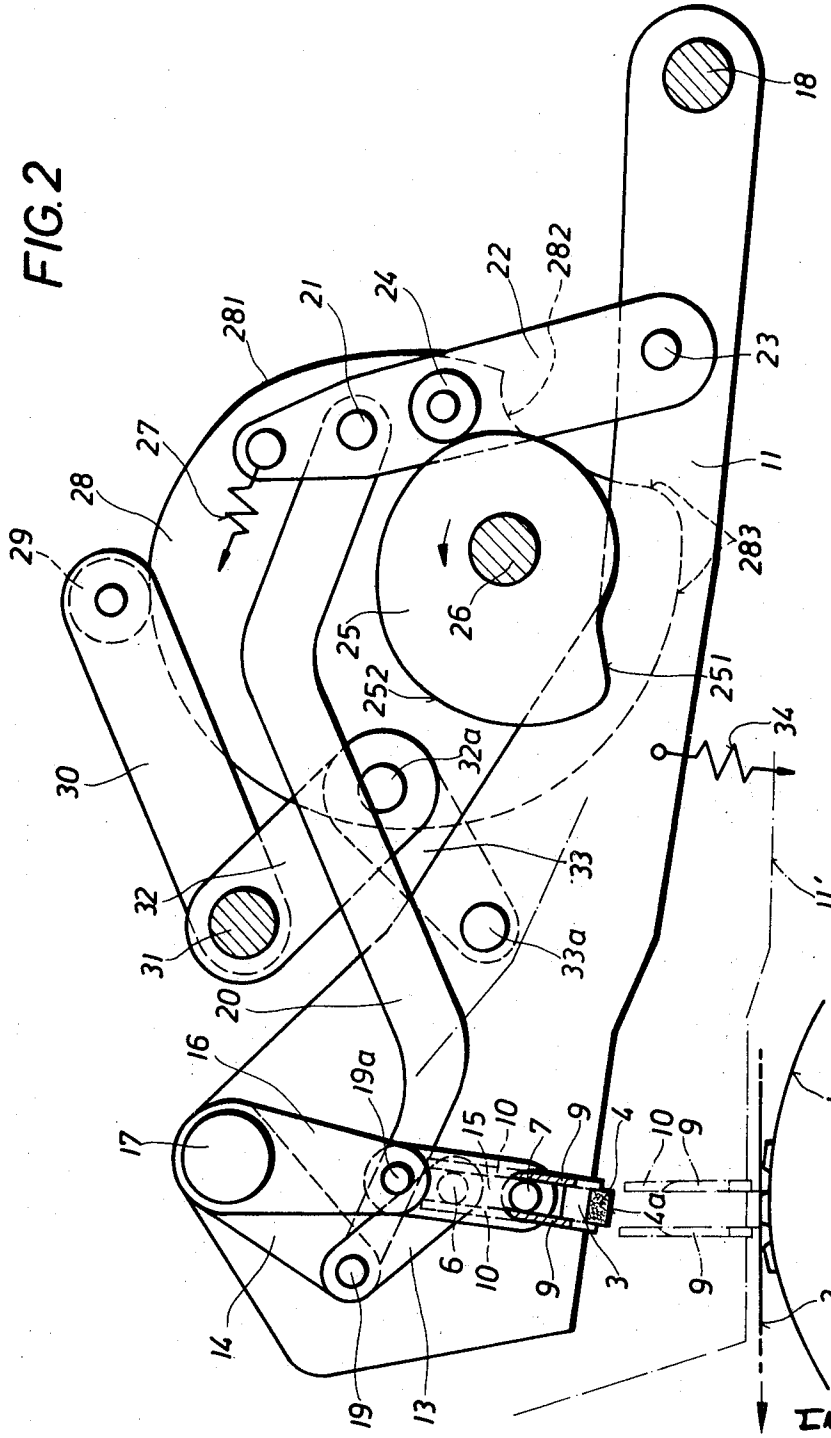
FIG.1



INVENTORS:
PAUL THEVIS
ADOLF SCHNEIDER
HORST JAKUBASCHK

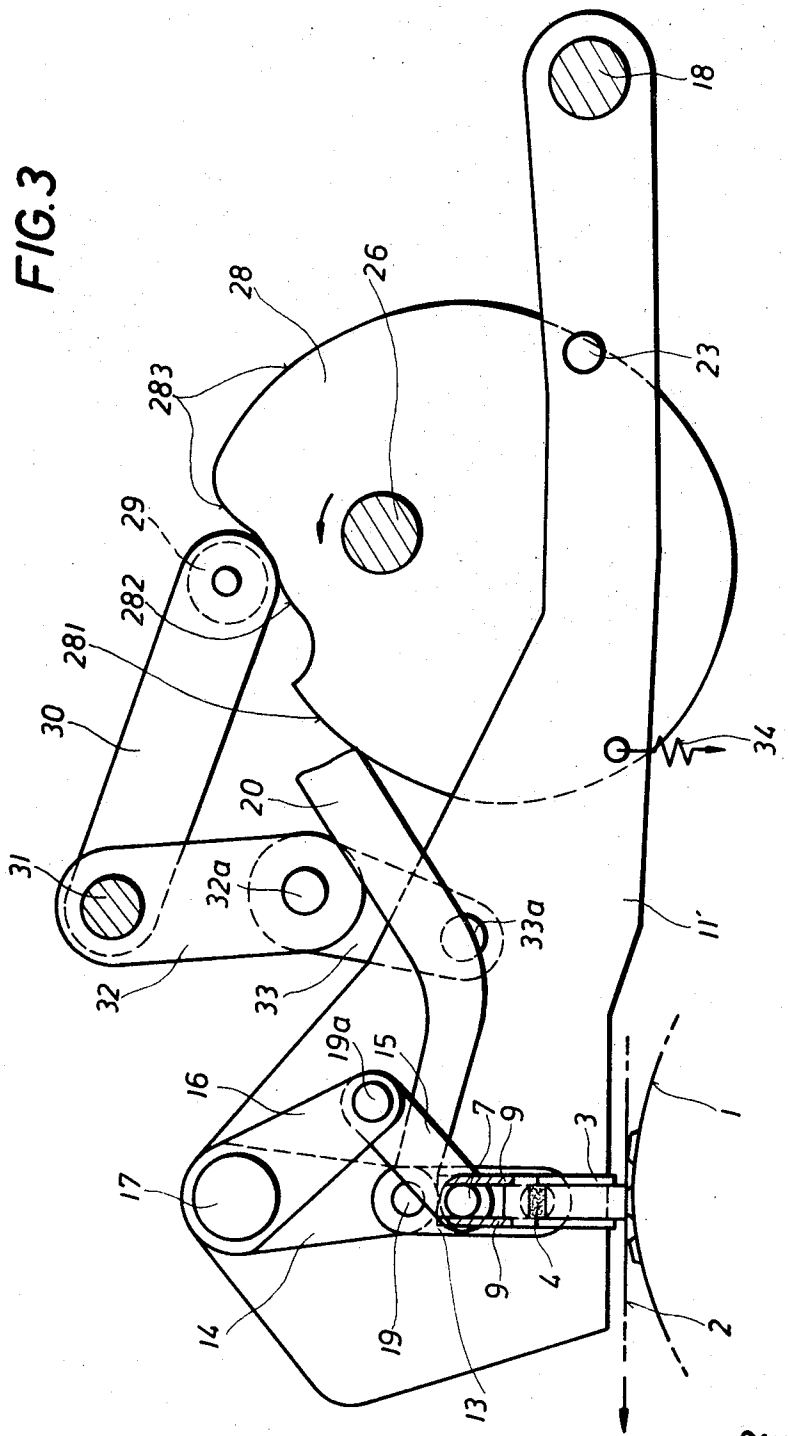
BY: [signature]
ATTORNEY

FIG. 2



INVENTORS:
PAUL THEIS
ADOLF SCHNEIDER
HORST JAKUBASCHK
BY: Jurgen S. Stuhlmann
ATTORNEY

FIG. 3



INVENTORS
PAUL THEVIS
ADOLF SCHNEIDE
HORST JAKUBASCHK

BY: [signature]
ATTORNEY

ROCKABLE IMPRESSION DEVICE FOR A PRINTING MACHINE

BACKGROUND OF THE INVENTION

Parallel printers for calculating and accounting machines, cash registers, check printers, and other business machines are known in which a row of axially aligned types of ordinal printing wheels is imprinted on a copy sheet by means of an inked ribbon or sheet, due to the rolling of an impression roller in a longitudinal direction of the row of types, and on the copy sheet so that the same is pressed against the row of types.

The apparatus disclosed in the U. S. Pat. No. 3,309,987 includes an impression roller which is moved by the action of a spring first toward a row of types, and is then rolled by means of another spring in the direction of the row of types for obtaining an imprint of the same, whereupon finally the impression roller is moved away from the row of types and returned to its initial position of rest.

The apparatus has certain disadvantages, for example, since the diameter of the impression roller is comparatively small, the same falls successively into the spaces between adjacent types and is then forced again to the end face of the next type so that the impression roller and the parts connected with the same perform an oscillatory movement perpendicularly to the type faces which causes irregular imprints, and an undesirable disturbing rumbling noise. Furthermore, the pressure of the impression roller causes the edges of the types to make undesirable impressions in the copy sheet, and it even happens that the copy sheet, and the inked ribbon, are displaced in the direction of the row of types due to the action of the rolling impression roller. For obtaining a clean and sharp imprint, it is also necessary that the individual types are movably mounted so that the type faces can adapt to the position of the cylindrical surface of the impression roller. Finally, printing is only possible by moving the roller in one direction along the row of types.

SUMMARY OF THE INVENTION

It is one object of the invention to overcome the disadvantages of known impression devices according to the prior art, and to provide an impression device of simple construction which reliably operates to obtain perfect imprints.

Another object of the invention is to press a copy sheet simultaneously against at least two types of an aligned row of types.

Another object of the invention is to obtain an impression force by a rocking movement rather than by a rolling movement of an impression member.

With these objects in view, the present invention provides an impression member which has a curved impression surface convex toward the printing type faces, and rocking on a copy sheet on the same due to alternate movement of the ends of the impression member toward and away from the row of types.

A preferred embodiment of the invention comprises printing means having an elongated printing surface formed preferably by a row of types of an ordinal series of printing wheels; an impression member having an elongated curved impression surface extending along the printing surface and being convex toward the same and a copy sheet thereon; frame means mounting the impression member for rocking movement of the convex curved impression surface on the sheet and printing surface between first and second positions in which the curved impression surface abuts the sheet in the regions of the ends of the printing surface, respectively; and operating means for moving the impression member between the first and second positions so that the sheet is pressed by successive portions of the impression surface rocking thereon against the printing surface for receiving an imprint.

The operating means include actuating means for alternately moving the ends of the impression member in opposite directions toward and away from the printing means so that the rocking movement is obtained.

Preferably, the actuating means are mounted on the frame which is operated by drive means to rapidly move with the impression member toward the printing means until one end of the impression surface rests on the sheet, whereupon the actuating means become operative to obtain an impression by rocking the impression member along the elongated printing surface formed by a row of types. In order to synchronize the movement of the frame with the impression member toward the printing means, and the rocking movement of the impression member along the printing means, two drive cams on a common drive shaft are provided whose cam follower means control the rocking movement, and the movement of the frame to take place in a predetermined sequence.

The apparatus of the invention has the advantage that the entire mass moving during the printing operation is small due to the crescent shape of the rockable impression member, and that this small mass is only moved toward and away from the printing surface, and not along the same since this movement is replaced by the rocking movement. Since the curved impression surface rocking on the sheet, does not move along the elongated printing surface, displacement of the sheet on the same is prevented, and the sheet is held in precise contact with the type faces of the row of type forming the printing surface. Only a small drive force is required for obtaining the rocking movement, so that the impression device of the invention can be advantageously used in high-speed printers.

Since it is possible to select the radius of curvature of the curved impression surface very great so that the arc of the curved impression surface is comparatively flat, the impression surface simultaneously abuts during its rocking movement at least two adjacent type faces so that it is not necessary to resiliently mount the types, while nevertheless uniform imprints are made, and the noise is reduced to a minimum. Furthermore, the impression device of the invention permits printing during the forward rocking movement, as well as during the return rocking movement of the rockable impression member.

For obtaining the rocking motion, the ends of the impression member are preferably connected by universal joints with pairs of toggle levers which are alternately folded and extended by a cam follower linkage under the control of a cam. The impression member is mounted on a frame which is moved toward and away from the row of types by a cam follower linkage cooperating with a rotary drive cam. The return movement of the frame is either obtained by a spring, or

another cam may be provided for returning the frame with the impression member mounted thereon, to a position of rest spaced from the printing means for insertion of another copy sheet.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction, and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a front elevation, partially in vertical section, illustrating an embodiment of the invention;

FIG. 2 is a side elevation, partially in section, illustrating the impression device of FIG. 1 on a larger scale in an initial position of rest; and

FIG. 3 is a side elevation corresponding to FIG. 2, but illustrating the impression device at the end of a printing operation.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

A parallel printer has a row of ordinal printing wheels 1 carrying circumferentially spaced types representing the digits from zero to 9, and other characters. The type faces of the type are covered by a band-shaped or card-shaped impression carrier sheet, and by an ink carrier sheet, together designated by the reference numeral 2.

Frame means including two frame walls 11 connected by a shaft 17, are mounted for angular movement about a stationary support shaft 18 between the position shown in FIG. 2, and the position shown in FIGS. 1 and 3. The frame walls 11 have slots 10 perpendicular to the surface of the printing types 1 and guiding two guide end portions 9 of an impression member 3 for movement toward and away from the printing surface. Impression member 3 has a curved surface 3*a* covered by an elastic cover 4 which has an outer curved impression surface 4*a* convex toward the sheet 2 and the faces of types 1.

In the position of the frame means 11, 17 illustrated in FIGS. 1 and 3, one end of the curved impression surface 4*a* abuts at one end the sheet 2 in the region of the corresponding end of the elongated printing surface formed by the row of axially aligned types 1, but when the respective other end portion 9 of impression member 3 is moved toward the sheet 2 and the types 1, the curved impression surface 4*a* rocks along the sheet 2 and presses the same against the type faces of the types 1. The radius of curvature of the impression surface 4*a* is comparatively great, so that the curvature of the impression surface 4*a* is flat, and in any position of impression member 3 rocking on sheet 2, the sheet is pressed by the impression surface 4*a* against the type faces of at least two types 1.

The impression member 3 has a longitudinal bore in which a shaft 5 is located which has end portions 6 and 7 projecting out of the bore in impression member 3. Portions 6 and 7 are round joint heads, portion 6 being substantially spherical, and portion 7 being more elongated and substantially pear-shaped. Shaft 5 has a flange 8 abutting impression member 3 and determining the position of the joint heads 6 and 7.

Impression member 3 has a projecting ear to which one end of a spring 12 is secured whose other end is attached to lever 16 so that impression member 3 is urged against the flange 8 so that the same with shaft 5 and joint head 7 is biassed toward the right until the end of joint head 7 abuts the respective frame wall 11. In this manner, a lateral vibration of impression member 3 is prevented.

A pair of toggle levers 13, 14 is connected by pin 19, and another pair of toggle levers 15, 16 is connected by pin 19*a*. The ends of toggle levers 14 and 16 are fixedly secured, for example by welding, to the ends of shaft 17 which is rotatably mounted in the frame walls 11. The lower ends of toggle levers 13 and 15 have opening receiving the joint heads 6 and 7, and forming with the same universal joints permitting an angular displacement of the joint heads in the respective openings of toggle levers 13 and 15 during the rocking movement of impression member 3.

In the position shown in FIGS. 1 and 2, the pair of toggle levers 13 and 14 is folded, and the pair of toggle levers 15 and 16 is extended and aligned so that the impression member 3 assumes the position best seen in FIG. 1. In order to place the rocking member 3 in the position 3′ shown in chain lines in FIG. 1, it is necessary to place toggle levers 13 and 14 in the extended aligned position, and toggle levers 15 and 16 in the folded position, as shown in FIG. 3. Due to the fact that the pairs of toggle levers are connected by shaft 17, movement of the pair of toggle levers 13, 14 from the folded position shown in FIG. 2 to the extended and aligned position shown in FIG. 3, will cause simultaneous movement of the pair of toggle levers 15, 16 from the extended aligned position shown in FIG. 2 to the folded position shown in FIG. 3 so that shifting of the toggle levers will cause a rocking motion of impression member 3 and rocking of impression surface 4*a* along the length of the row of types 1 for obtaining successive impressions of the same on the copy sheet 2.

The pivot pin 19 of the first pair of toggle levers 13, 14 passes also through a link 20, best seen in FIG. 2. The other end of link 20 is connected by a pivot 21 with a follower arm 22 mounted on a pivot 23 connected with the frame wall 11. Follower arm 22 carries a follower roller 24 engaging the peripheral cam track of a drive cam 25 which is secured to a rotary drive shaft 26.

During each revolution of drive shaft 26 and of cam 25, follower arm 22 and roller 24 arc angularly displaced in clockwise direction as viewed in FIG. 2 by the rising cam track 252, and is returned in counterclockwise direction by spring 27 connected to stationary support means, not shown, when follower roller 24 is located opposite the lower cam track portions of cam 25. The shifting of follower arm 22 in clockwise direction by the rising cam track portion 252 causes movement of link 20 and shifting of the pair of toggle levers 13, 14 from the folded position of FIG. 2 to the aligned position of FIG. 3, and due to the fact that toggle levers 14 and 16 are both fixedly secured to shaft 17, toggle levers 15, 16 are moved from the aligned position shown in FIG. 2 to the folded position shown in FIG. 3, resulting in a rocking motion of the impres-

sion member 3. As seen in FIG. 2, the guide members 9 slide in slots 10 of the respective frame walls 11 during the displacement of the pairs of toggle levers and the ends of the rocking impression member 3.

The rocking movement of impression member 3 must take place when the frame 11 is in the operative end position shown in FIG. 3 in the proximity of the types 1. As shown in FIG. 2, drive shaft 26 carries another drive cam 28 having a gradually falling cam track portion 281, a recessed cam track portion 282, and a rising cam track portion 283, as considered in the counterclockwise direction of rotation of drive cam 28. Another cam follower 30 has a follower roller 29 cooperating with the cam track of drive cam 28. Follower 30 is fixedly secured to a shaft 31 mounted on supporting means, not shown, and carrying another fixed link 32 connected by a pivot 32*a* with an arm 33 connected by a pivot 33*a* with a frame wall 11. A spring 34 is connected to frame 11 and urges the same to turn about supporting shaft 18 in counterclockwise direction, together with impression member 3 and the actuating means 13, 14, 20, 22 of the same while follower roller 29 is urged by the linkage 33, 32 and cam follower 30 against the cam track of drive cam 28.

OPERATION

Assuming that the device is in the position shown in FIG. 2 in which frame 11 is in a position in which impression surface 4*a* is spaced from the sheet 2 and the types 1, it is possible to rotate the printing wheels so that an axial row of selected types representing digits are aligned coextensive with, but spaced from the impression surface 4*a*. Shaft 26 is turned one revolution in counterclockwise direction, together with drive cam 28 whose falling cam track portion 281 causes movement of follower 30, turning of shaft 31 and of link 32, and displacement of link 33 with frame 11 to the position 11′ shown in chain lines in FIG. 2, and in solid lines in FIG. 3. Due to the movement of frame 11 toward the sheet 2, the impression member 3, which is in one of its end positions, approaches the portion of sheet 2 covering the respective row of types 1. When the recessed cam track portion 282 arrives in a position opposite follower roller 29, spring 34 is effective through frame 11 and linkage 33, 32, 30, to move follower 30 rapidly inward with follower roller 29 entering the recessed cam track portion 282. This rapid movement of the frame 11 by the action of spring 34, rapidly moves the impression member 3 to a position in which one end of the impression surface 4*a* abuts the sheet in the region of the end of the row of types 1, as shown in FIG. 1. As is apparent from FIG. 3, the recessed cam track portion 282 is so deep that follower roller 29 permits the free movement of frame 11 with impression member 3 by the force of spring 34 which also presses impression member 3 against the sheet 2 and the printing types 1, the pressure being increased by the weight of the frame 11 and of the impression member 3.

During the above-described movement of impression member 3 with frame 11 toward the printing means 1, the rising cam track portion 251 of the drive cam 25 has approached follower roller 24 of follower 22 so far that the cam 25 begins to turn follower lever 22 in clockwise direction, so that link 20 is pulled to the right and turns through pivot 19, toggle lever 14 in counterclockwise direction and toggle lever 13 in clockwise direction so that the toggle levers 13, 14 assume the aligned position shown in FIG. 3. Since toggle lever 14 is connected by shaft 17 with toggle lever 16, the pair of toggle levers 15, 16 is shifted from the aligned extended position to the folded position, as also shown in FIG. 3. Due to the extending of the pair of toggle levers 13, 14, and the folding of the toggle levers 15, 16, the left end of the impression member 3, as viewed in FIG. 1, is lowered and moved toward the printing types 1, while the right end is raised so that the impression member 3 is forced to rock with the impression surface 4*a* in the direction of the line of types 1 whereby the intermediate sheet 2 is pressed against the type faces, and receives imprints from the same. At the end of this printing operation, impression member 3 assumes the position 3′ shown in chain lines in FIG. 1.

From the above description it is apparent that link 20 is a coupling member for the quadrilateral linkage 23, 21, 19, 17 which is provided for alternately actuating the pairs of toggle levers 13, 14 and 15, 16 which are connected with each other by shaft 17. Follower lever 22 of the linkage 23, 21, 19, 17 is mounted on the frame 11 and cooperates with cam 25. Coupling member 20 connects follower 22 with toggle lever 14 of the pair of toggle levers 13, 14, and toggle lever 14 is also mounted on frame 11.

After termination of a printing operation, the rising cam track portion 283 of drive cam 28 moves follower 30 and linkage 32, 33 so that frame 11 is moved upward about support shaft 18 to the position shown in FIG. 2. When frame 11 is in this high inoperative position, the falling cam track portion 252 of drive cam 25 acts through levers 22 and 20 and the pairs of toggle levers 13, 14 and 15, 16 on the rocking impression member 3 to return the same to the initial position.

A modified construction is possible in which the drive cams 25 and 28 are turned only half a revolution during each printing operation, and are so constructed that a rocking movement of the impression member 3, and the consequent printing operation, takes place during the forward movement of the impression member as well as during the return movement of the impression member.

It is also possible to increase the speed of the movement of frame 11 with impression member 3 toward the printing surface, and also the return of the same, by providing one drive cam for moving the frame toward the printing surface, and an oppositely acting drive cam for returning the frame 11 in the movement away from the printing surface, instead of using spring 34 for moving frame 11 with the impression member 3 toward the printing surface.

In the illustrated embodiment, two guide plates 9 at either end of impression member 3 are provided in slots 10, and evidently, a single guide member 9 on either end of impression member 3 could serve the same purpose.

From the above description, it is apparent that in the preferred embodiment of the invention, the operating means of the device include actuating means 13 to 22 mounted on frame 11, and drive means 26, 25 for operating the actuating means. The drive means further include cam 28 and the linkage 29 to 33 for moving frame 11, together with the actuating means, toward and away from the printing means 1.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of impression devices differing from the types described above.

While the invention has been illustrated and described as embodied in an impression device including a rockable impression member for pressing a sheet against a printing surface, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims.

We claim:

1. Rockable impression device for a printing machine comprising printing means having an elongated printing surface for printing on a sheet thereon; impression means including an impression member having an elongated curved impression surface extending along said printing surface and being convex toward the same and the sheet thereon, said impression member having a first guide means at each end thereof; frame means mounting said impression member for rocking movement of said curved convex impression surface on the sheet in the regions of the ends of said printing surface, respectively, said frame means including two second guide means extending perpendicularly to said printing surface and guiding said two first guide means, respectively, for movement in opposite directions; and operating means mounted on said frame means for moving said impression member between said first and second positions so that the sheet is pressed against said printing surface by successive portions of said curved impression surface rocking on the sheet and printing surface in one direction, said operating means including actuating means mounted on said frame means for alternately moving said two first guide means toward and away from said printing surface, whereby said curved impression surface rocks on said sheet and printing surface, said actuating means including first and second pairs of first and second toggle levers, and first and second universal joints at said ends of said impression member connected with said first toggle levers of said first and second pairs, and an actuating shaft mounted on said frame means fixedly carrying said second toggle levers of said first and second pairs in a relative position in which the toggle levers of any one pair are folded when the toggle levers of the other pair are extended whereby the ends of said impression member are alternately moved in opposite directions for rocking said impression member between said first and second positions.

2. Impression device as claimed in claim 1 wherein said impression means include a shaft passing through said impression member and having end portions projecting from said ends of the same, and being formed as substantially spherical joint heads engaging openings in said first toggle levers of said first and second pairs and forming with the same said universal joints.

3. Impression device as claimed in claim 1 wherein said operating means further include drive means for said actuating means, said drive means including a rotary drive shaft, a drive cam on said drive shaft, and a cam follower linkage connected with at least one of said first and second pairs of first and second toggle levers for alternately folding and extending said toggle levers of said first and second pairs.

4. Impression device as claimed in claim 3 wherein said drive means further include return means for moving said cam follower linkage after operation by said drive cam to a position in which the folded toggle levers are extended and the extended toggle levers are folded.

5. Impression device as claimed in claim 1 wherein the length of said impression surface is substantially the same as the length of said printing surface so that said impression surface presses the sheet against said printing surface along the entire length of the same during one rocking motion of said impression member in one direction.

6. Impression device as claimed in claim 1 wherein said impression member has a supporting surface, and includes a cover on said supporting surface consisting of an elastomer and forming said curved impression surface so that said impression surface resiliently abuts said sheet on said printing surface.

7. Impression device as claimed in claim 1 wherein said printing machine is a parallel printer; wherein said printing means include an ordinal series of coaxial printing wheels, each printing wheel having circumferentially spaced types aligned in axial rows, one of said axial rows of types forming said elongated printing surface for supporting a line portion of the sheet on said one row of types; and wherein said curved impression surface has a great radius of curvature selected so that said impression surface simultaneously abuts at least two types of said one row during rocking.

8. Rockable impression device for a printing machine, comprising printing means having an elongated printing surface for printing on a sheet thereon; impression means including an impression member having an elongated curved impression surface extending along said printing surface and being convex toward the same and the sheet thereon; frame means mounting said impression member for rocking movement of said convex curved impression surface on the sheet and printing surface between first and second positions in which said curved impression surface abuts the sheet in the regions of the ends of said printing surface, respectively; and operating means mounted on said frame means for moving said impression member between said first and second positions so that the sheet is pressed against said printing surface by successive portions of said curved impression surface rocking on the sheet and printing surface in one direction, said operating means including actuating means mounted on said frame means for alternately moving the ends of said impression member toward and away from said printing means so that said impression surface rocks on the sheet on said printing surface, and drive means including a rotary drive cam, and cam follower means connecting said drive cam with said actuating means; sup-

port means for mounting said frame means with said actuating means and impression member for movement toward and away from said printing means; said drive means being mounted on said support means and including another drive cam and another cam follower means cooperating with said drive cam and connected with said frame means; biasing means for biasing said frame means and other cam follower means toward said other drive cam so that the same permits movement of said frame means toward said printing means whereby one end of said impression surface abuts said sheet and said printing surface whereupon said actuating means effect a rocking movement of said impression member and of said impression surface on the sheet and printing surface, said drive means including a rotary drive shaft mounted on said support means fixedly carrying said drive cams, said other cam follower means including a follower cooperating with said other drive cam, another shaft mounted on said support means and secured to said follower, and a linkage connecting said other shaft with said frame means.

9. Impression device as claimed in claim 8 wherein said actuating means include a shaft mounted on said frame means, first and second toggle lever means connected with the ends of said impression member, respectively, and with said shaft on said frame means, wherein said cam follower means of said actuating means include a cam follower having one end pivotally connected with said frame means, and a linkage connecting said cam follower with at least one of said first and second toggle lever means for alternately moving the same between folded and aligned positions.

10. Impression device as claimed in claim 8 wherein said other drive means include spring means secured to said support means and said frame means for urging said frame means toward said printing surface to an end position in which said impression surface abuts said sheet and printing surface and said actuating means rock said impression member; and wherein said other drive cam has a recessed cam track portion located opposite said other cam follower means when said frame means is near said end position so that said frame means is rapidly moved by said spring means to said end position.

* * * * *