July 7, 1936. K. A. KNUTSEN 2,046,465

CARD CONTROLLED DEVICE

Filed March 17, 1934 2 Sheets-Sheet 1

Fig. 1

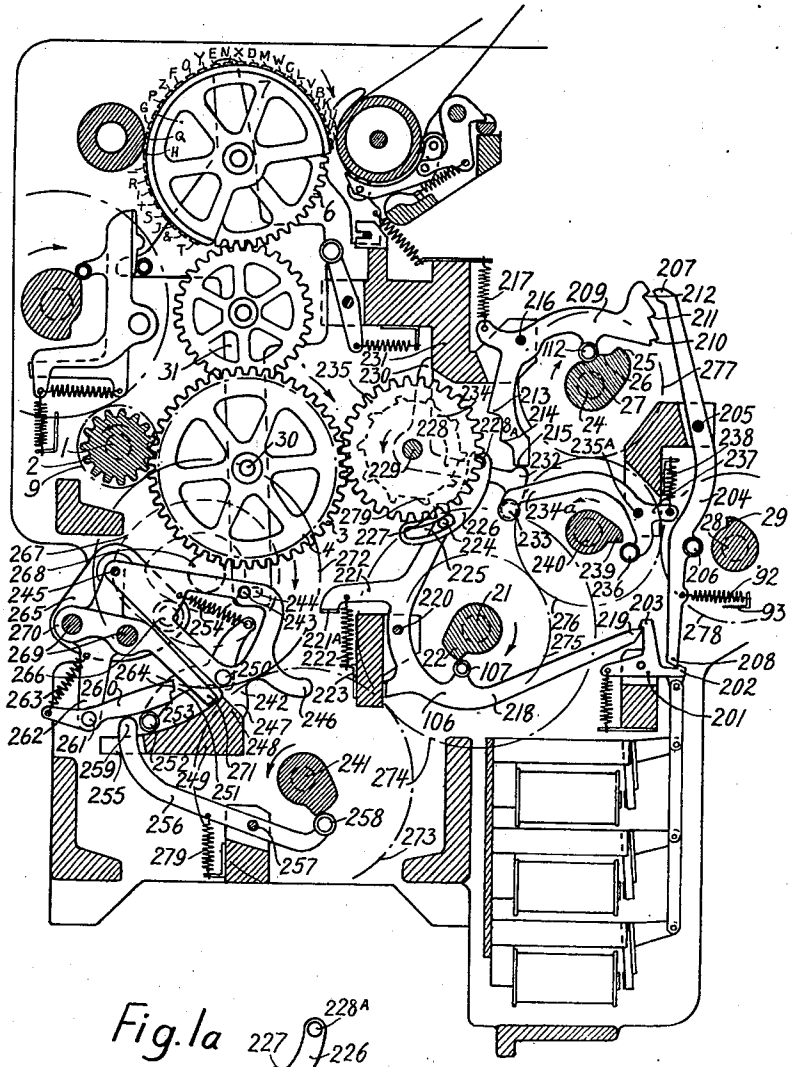


Fig. 1a

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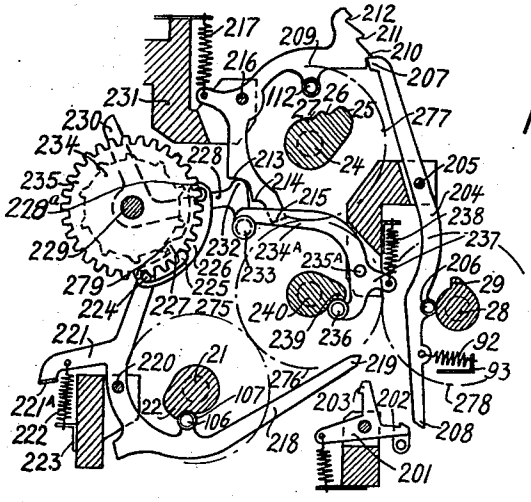


Fig. 2

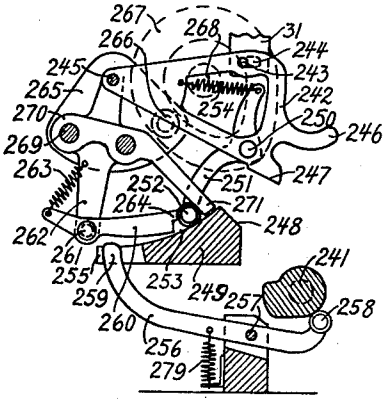


Fig. 3

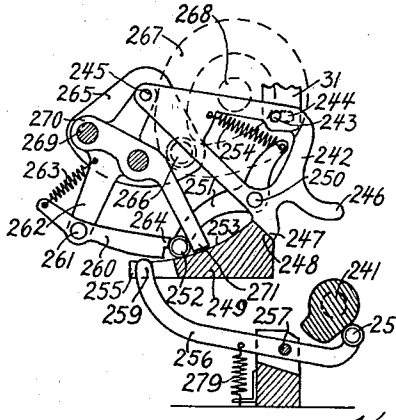


Fig. 4

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2,046,465

UNITED STATES PATENT OFFICE

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CARD CONTROLLED DEVICE

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Application March 17, 1934, Serial No. 716,156
In France March 20, 1933

10 Claims. (Cl. 101—91)

This invention relates to automatically printing devices, particularly adapted to be used in combination with statistical, calculating and tabulating machines utilizing perforated cards.

It relates especially to improvements to a printing device as described in the United States patent application No. 663,628 filed the 30th March 1933.

In the named application, the printing is effected when a toothed sector is brought into mesh with a constantly rotating wheel which itself is meshing with the typewheel. According to the present invention, the toothed sector is replaced by a toothed wheel mounted on a stationary axis, this wheel always being in mesh with the type wheel.

This arrangement facilitates the guiding of the carriage in the course of the printing motion, which gives the advantage of a better alignment of the letters on the paper. Another advantage of this embodiment consists in that the named toothed wheel that has to be stopped by the blocking lever in order to effect the printing, can have a small number of teeth which increases the time available for the blocking of the wheel and permits increase in the speed of the machine.

Finally, according to this invention, there is provided a brake which reduces the speed with which the carriage returns to its initial position, during the last phase of the return movement, and accordingly permits reduction of the noise when the carriage stops.

Other objects of the invention consist in new and improved structures and cooperations of the different elements of the mechanism.

The following description with reference to the accompanying drawings, given by way of example, will set forth in what manner the invention can be carried out.

Figs. 1 to 4 are vertical diagrammatic sectional views of the printing device according to the invention, these respective views showing the apparatus or a part of it in different positions in its operation.

Fig. 1 shows the complete apparatus in the position of rest.

Fig. 1*a* shows a detail of Fig. 1.

Fig. 2 shows certain elements in the position corresponding to the printing of a character or sign indicated by two perforations in the card, one of which is located in the first line of the card.

Figs. 3 and 4, show in two different working positions, the mechanism for braking and blocking the carriage.

The organs which have not been altered bear the same reference numbers as in the aforementioned application. The elements which have been modified or inserted according to the present invention have reference numbers above 200.

Lever **201** corresponds to lever **85** of the first named application. It carries two latches **202** and **203**. The lever **204** corresponds to the lever **79**. It pivots about the pin **205** fixed to the frame, and carries the roller **206**, the extension **207** and the detent **208**. The lever **209** works like the lever **89**. It carries teeth **210**, **211** and **212**, roller **112** and stops **213**, **214**, **215**. It pivots about the stationary spindle **216** under the action of the spring **217** which tends to apply the roller **112** against the cam on shaft **24**. The lever **218** or releasing lever effects the same functions as the lever **81** of the first named patent. It carries the extension **219**, a pin **106** provided with a roller **107** and is pivoted to the spindle **220** attached to the frame.

To an arm **221**, there is attached a spring **222** fixed at its other end to the frame through **223**. Arm **221** carries a stop plate **221A**. Lever **218** further carries on an extremity a pin **224** which is engaged in a slot **225** of the blocking sector **226**. Sector **226** which corresponds to the sector **109** of the previous application, is provided with one or a plurality of teeth **227** and is articulated at **228***a*, to a lever **228** which corresponds to the lever **80**.

Lever **228** turns freely about the axis **229** fixed to the frame. It carries an arm **230** which acts as a stop against the frame **231**, an extension **232** and a roller **233**.

In the same plane as sector **226**, there is a ratchet-wheel **234**, which is integral with wheel **235**, and which with this latter rotates freely about the axis **229**.

The roller **233** is provided with a slot in which is engaged the extremity of a lever **234***a*, which pivots on the spindle **235***a*, fixed to the frame. Lever **234***a* carries a roller **236** and an arm **237** to which is fastened a spring **238**, the opposite end of which is fixed to the frame. Lever **234***a*, is retained in the position indicated in Fig. 1 by cam **239** fixed on the shaft **240**, which cam during its rotation acts upon the roller **236**.

The shafts **24**, **240**, **21**, **28** and **241** are provided with toothed wheels meshing one with another, so that all these shafts rotate synchronously with the type-carrying wheel **7**. Wheel **235** is always in mesh with the toothed wheel **3**, which, as well as all the wheels situated on the movable support **31**, is identical to that described in the previous patent application.

The lower part of the support 31 has been altered from the previous application. Instead of being attached by an arm 34 to a spindle 38, the support 31 according to this invention is connected in a manner permitting slight relative displacement thereof to an oscillating lever 242 by a pin 243 fixed on 242, which pin engages in a slot 244 of the support 31. The lever 242 pivots about the stationary spindle 245 and carries an arm 246 which can strike against the stop plate 221a of the arm 221, when support 31 is moved and the printing effected.

The lever 242 also carries a stop 247 which engages the inclined surface 248 of the cross beam 249. The lever 242 carries finally a pin 250 about which is pivoted a lever 251, which at one of its extremities is provided with a roller 252 cooperating with a curved surface 253 of the cross beam 249, and to its other extremity is secured a spring 254 attached to the lever 242. The cross beam 249 is provided on one side with a comb 255, which forms a guide for the lever 256. The latter pivots about a stationary spindle 257 and is provided with a roller 258 cooperating with a cam on shaft 241.

The other extremity 259 of the lever 256 can bear against a lever 260 which pivots about a pin 261 fixed on the lever 262. Lever 260 is kept in position by a spring 263 attached to the lever 262, and is provided with a detent 264. On each side of the machine, near the side plates that form the frame and pivotally mounted on the spindle 245, is situated a piece 265, which carries a roller 266 which is engaged in a groove 267 of a closed cam that turns about an axis 268 fixed to the adjacent side plate.

The two pieces 265 are connected together by two rods 269 on which are sleeved the pieces 270 and 262. For each support 31, there is a piece 270 and 262. The piece 262 is also sleeved on the spindle 245. All of the pieces 262 and 270 are tightly held one against the other and against the two lateral pieces 265, so as to form a unit, which is moved angularly about the spindle 245 by the closed cam which rotates about the axis 268.

There is a closed cam on each side of the machine. Piece 270 carries an extension 271. On the main shaft 1 is keyed a toothed wheel 9 in mesh with the wheel 272 rigidly fixed to the closed cam which rotates about the axis 268. Wheel 272 meshes with the wheels 273 and 274 keyed to the shafts 241 and 21 respectively. The latter carries a wheel 275 which meshes with the wheels 276, 277 and 278 which are respectively keyed on the shafts 240, 24 and 28. When the machine is operated, the shafts 241, 21, 240, 24 and 28, as well as the closed cam make one revolution for each revolution of the type-carrying wheel, that is to say, turns in synchronism with it. The whole of the pieces 262, 270, 265 perform during the printing operations the movement indicated in Figs. 3 and 4.

While the printing takes place, the pieces 270 and 262 occupy the position indicated in Fig. 1.

If now, a character is to be printed, the support 31 of the carriage moves upwards. The lever 242 connected to the support 31 follows the motion of the latter, and draws along the lever 251 attached to it. Before the first character is printed, the cam 241 releases the roller 258 and lever 256 has swung under the action of the spring 279, thus the extremity 259 does not interfere with the movement of the lever 260. The carriage having reached its uppermost position is blocked in that position by lever 260 which, under the action of the spring 263 takes the position shown in Fig. 3, thus blocking the roller 252 and the lever 251.

After the printing, the type-carrying wheel remains spaced from the paper cylinder in its upper position of rest. In the previous application, this blocking was effected by a roller 46 leaning against the lower surface of slide 45. When all the characters of the card are printed, the support 31 is brought to its initial position by the movement of the closed cam, the groove 267 of which, acts upon the roller 266, causing the swinging of the whole of the pieces 265, 270, 262, so as to return them to the position indicated in Fig. 4.

During this movement, the extension 271 of the piece 270 pushes the roller 252 and brings back the support 31 in its initial position. Support 31 cannot perform this movement quicker than lever 260, which still blocks roller 252. Provided a suitable shape is given the groove 267, the movement can be braked during its last phase, so that the stop 247 of the lever 242 does not strike the inclined surface 248 violently, but engages it with a low speed, Fig. 3, or stops its motion a little before, leaving a small interval between the stop 247 and the inclined surface 248. Subsequently, cam on the shaft 241 strikes against roller 258, lever 256 swings against the action of the spring 279, and disengages lever 260 from roller 252. The pieces 270 and 262 may then resume their initial position Fig. 1, without acting on lever 251 or on support 31.

It will now be explained how the printing is effected.

In the previous application, the perforations of a card or band release two levers by electrical or mechanical means. According to the present invention, the lever 204 corresponding to lever 79 in the previous application, is released by perforations made in the line 9 or 8 of the card. The other lever 218 corresponding to the previous lever 81 being released by the perforations made in the other lines, but blocked up when the lever 204 is released, due to the existence of perforations in line 9 or 8, by the cam 22 on shaft 21. If a perforation exists in the line 9, the extension 207 of the lever 204, blocks up the tooth 210 of the lever 209. If a perforation exists in the line 8, the extension 207 engages in the tooth 211 of the lever 209. If no perforations exist in the line 9 or 8, lever 209 takes, during the printing operation, the position shown in Fig. 1. When the lever 218 is released, the cam 22 on shaft 21 being no longer in front of the roller 107 of the lever 218, this lever swings under the action of the spring 222 and engages a tooth of the sector 226 with a tooth of the ratchet wheel 234. The latter rotates constantly together with the wheel 235, which is in mesh with wheel 3. If lever 209 is situated in the position as shown in Fig. 1, the ratchet-wheel is suddenly stopped when tooth 227 of sector 226 engages itself with a tooth of said ratchet-wheel, because the lever 228 is prevented from turning, due to the fact that the extension 232 of this lever applies against stop 215.

Thus, the wheel 235 is stopped, but as the main shaft 1 continues its rotation, the wheel 3 is forced to move on the wheel 235, the latter functioning as a toothed-rack. Wheel 3 and the support 31 are moved upwards and the printing

operation is completed as explained in the previous patent.

Let us suppose, for instance, that letter "U" is to be printed. This letter which follows immediately the letter "A" on the type-carrying wheel, is represented on the card by two perforations, one in the line 8, the other in the line 7. When perforation 8 engages itself under the contact device, roller 112 is on the portion 26 of the cam 24, so that the tooth 211 of the lever 209 is situated opposite the extension 207 of the lever 204, further, at this moment, roller 107 of the lever 218 is situated on the cam 22 of the shaft 21. The only effect of the passage of the perforation 8 under the contact device, is therefore the releasing of the lever 204, the extension 207 of which, engages itself with the tooth 211 of lever 209. Immediately afterwards, the perforation 7 passes under the contact device and releases lever 218, the roller 107 of which is no more opposite cam 22. This lever pulled by spring 222 pivots and causes tooth 227 of sector 226 to mesh with ratchet-wheel 234.

Under the effect of the shock produced when the tooth of the ratchet-wheel 234 meets tooth 227 of sector 226, lever 228 swings, until the extension 232 strikes against the stop 214. The ratchet-wheel 234 is then stopped, and support 31 moves upwards, producing the printing of the type adjacent to type "A" on the typecarrying wheel, that is to say, the letter "U".

If lever 204 had been stopped in the position when the extension 207 is engaged under the tooth 212 of the lever 209, the contact of tooth 227 of the sector 226 and of the ratchet-wheel 234, would determine the swinging of the lever 228 until the extension 232 strikes against stop 213, and so the type which is at a distance of two types from the type "A", would be printed (letter K).

It is therefore possible to print three different characters, for each perforation of the card, with the exception of two perforations 8 and 9. Which character is printed, depends on the position of lever 208, that is, it depends on the fact whether there exists or not a supplementary perforation on one or another of the lines 9 or 8. Fig. 1 shows the position of the elements of the device at the moment when the line of perforations 7 of the card passes in front of the contact device.

Said card containing no perforations 8 or 9, the lever 204 is not released. If a card has a perforation in line 7, lever 218 is released, tooth 227 of sector 226 meets tooth 279 of ratchet-wheel 234, and the letter "A" is printed. If the card contains perforations in the lines 7 and 9, the lever 204 is released and extension 207 engaged with the tooth 210, as shown in Fig. 2. When perforation 7 arrives in front of the contact device, lever 218 is released and tooth 227 engages itself with tooth 279, as described above, but, as lever 228 moves backwards as shown in Fig. 2, the letter "K" is printed.

At the moment of printing, the center 30 of wheel 3, is situated substantially on the straight line joining the two axes 1 and 229. The distances between the three axes are chosen so as to give the least possible play between the three toothed-wheels 9, 3 and 235 in the said moment. When the type-carrying wheel strikes against the paper to effect the printing, support 31 pivots about center 30, and the slot 244 moves with respect to the pin 243; the center 30 will therefore be always in the same position when the printing is taking place, whatever the printed type may be, which secures a good alignment of the letters on the paper.

In the example chosen, the number of teeth of the ratchet-wheel 234 and of the wheel 235 is chosen in such a way that, everytime that a place of perforation in a column of a card passes in front of the contact device, a tooth of the ratchet-wheel passes in front of tooth 227 of lever 226.

The time available for the engagement of one tooth of the ratchet-wheel and of tooth 227 of lever 226, is the time elapsing between the passage of two adjacent teeth of the ratchet-wheel, or between the passage of two adjacent perforations of a column of a card in front of the contact device.

The types of the type-carrying wheel 7 may be either letters or figures, or both letters and figures.

The device so described may also work without selection, every letter or figure being indicated by one single perforation. In this case, it will be preferable to increase the number of places intended for the perforations in a column of the card, and to change the number of teeth of the ratchet-wheel 234 and of the wheel 235 to allow every tooth of the ratchet-wheel to correspond to a perforation. In the embodiment shown, the ratchet-wheel 234, makes one and a half revolutions for one revolution of the type-carrying wheel, which corresponds to the passage of a tooth of the ratchet-wheel in front of tooth 227 for each place of perforation on the card. The number of types on the type-carrying wheel may obviously be increased or decreased, and the lever 209 may comprise more or less teeth, similar to the teeth 213 and 214.

Also in the columns of the cards, a system of perforations, different than that above indicated, may be utilized; for instance, the releasing of lever 204 may be operated by a special contact device.

When the printing has been effected, the carriage continues its movement until the arm 246 strikes against the stop-plate 221*a*, of the lever 218, and causes the latter to swing against the action of the spring 222, so that the pin 224 rotates about the spindle 220, drawing together with it the blocking lever 226, so that the latter is disengaged from the ratchet-wheel 234. At this moment, roller 252 has reached the extremity of lever 260. This latter swings under the action of the spring 263, locking the lever 251. To facilitate this locking, the detent 264 may be provided with a stepped or inclined surface.

In the description given is mentioned a device for printing one letter in a column of the card. It is, however, understood that the complete printing device may comprise a great number of devices such as described.

For instance, if the printing device of the type described is to be connected with a tabulating machine for perforated cards, it may be desired that the printing device should print the figures or letters indicated in every column of the card; in this case, the printing device would comprise a series of 60 or 90 type-carrying wheels, and for every one of these type-carrying wheels, there would be a support 31, a ratchet-wheel 234, levers 218—204—209, blocking lever 226, and so on. Common for all the typecarrying wheels and the series of elements cited above, are the shafts 1, 241, 21, 240, 28, 24, 229, and the rods 269, the cross-beams 249 and so on. The named cross-

beams comprise one comb 255, for each lever 256. Different parts of the frame also comprise one comb for each piece 218, 209, 204, and so on.

The printing of all the indications of the card, may be made during one rotation of the type-carrying wheels. The device thus permits a series of characters to be printed simultaneously.

What I claim is:

1. In printing apparatus for use with statistical machines employing perforated cards or the like, the combination with a platen, of a type wheel support displaceable in a plane transverse to said platen, a type wheel rotatably mounted on said support, rotatable toothed means carried on said support for rotating said type wheel, rotatable toothed means meshing with said first named tooth means and mounted independently of said support, selectively operable means for retarding rotation of said last named toothed means to cause the latter to serve as a fulcrum for said first named toothed means, whereby said support and type wheel are displaced transversely of said platen, and means for moving said type wheel toward said platen to engage and print a selected type.

2. In printing apparatus for use with statistical machines employing perforated cards or the like, the combination with a platen, of a type wheel support displaceable in a plane transverse to said platen, a type wheel rotatably mounted on said support, gearing for rotating said type wheel, said gearing including a gear train carried on said support, a gear meshing with said gear train and mounted on a fixed axis, means for locking said last named gear against rotation to cause the same to serve as a fulcrum, whereby said support and type wheel are displaced transversely of said platen, the ratio and direction of rotation of the gears in said train being such that a selected type remains substantially stationary adjacent said platen during displacement of said support, and means for relatively displacing said platen and type wheel to print the selected type.

3. In printing apparatus for use with statistical machines employing perforated cards or the like, the combination with a platen, of a type wheel support displaceable in a plane transverse to said platen, a type wheel rotatably mounted on said support, gearing for rotating said type wheel, said gearing including a gear train carried on said support, a gear meshing with said gear train and mounted on a fixed axis, a blocking member supported for movement into an operative position, in which position the said member is operatively connected with and movable by said gear, selecting mechanism for moving said member into operative position and determining the extent of movement thereof by said gear, whereby after a predetermined degree of rotation of said gear the latter may serve as a fulcrum for said gear train to effect displacement of said support and type wheel transversely of said platen, the ratio and direction of rotation of the gears in said train being such that a selected type remains substantially stationary adjacent said platen during displacement of said support, and means for relatively displacing said platen and type wheel to print the selected type.

4. A printing machine particularly adapted to be used in combination with statistical machines for perforated cards and the like, comprising a platen, a type wheel mounted in a plane substantially at right angles to the axis of said platen, a ratchet mounted freely on a stationary axis and having an operative rotative connection with said type wheel, means for stopping said ratchet when a selected one of the types on the type wheel passes the printing position, means for imparting such translatory movement to said type wheel when the said ratchet has been stopped that the movement of the selected type in relation to the platen in a certain moment is zero, and means for giving the type wheel in this moment an additional movement directed against the platen, so that the type wheel strikes the platen.

5. A printing machine particularly adapted to be used in combination with statistical machines for perforated cards and the like, comprising a platen, a type wheel mounted in a plane substantially at right angles to the axis of said platen, a ratchet mounted freely on a stationary axis and having an operative rotative connection with said type wheel, a blocking lever supported for movement into mesh with said ratchet, means for displacing the blocking lever after it has come into mesh with said ratchet a distance corresponding to the turning of the type wheel one or more characters past the printing position, and means for arresting the blocking lever in a selected position.

6. A printing device for tabulating machines for perforated cards and the like, comprising a platen, a type wheel mounted in a plane substantially at right angles to the axis of said platen, a toothed wheel mounted freely on a stationary axis and having an operative rotative connection with said type wheel, a blocking lever situated opposite said toothed wheel, means for bringing the blocking lever into mesh with said toothed wheel in order to stop the wheel and print a selected one of the types on the type wheel, said toothed wheel being provided with such a number of teeth that one tooth is passing the blocking lever each time a place for perforation in a column of the card passes in front of the reading device of the tabulating machine.

7. A printing machine particularly adapted to be used in combination with statistical machines for perforated cards and the like, comprising a platen, a type wheel mounted on a support in a plane substantially at right angles to the axis of said platen, a ratchet mounted freely on a stationary axis and having an operative rotative connection with said type wheel, means for stopping said ratchet when a selected one of the types on the type wheel passes the printing position, means for imparting such translatory movement to said type wheel when the said ratchet has been stopped, that the movement of the selected type in relation to the platen in a certain moment is zero, means for giving the type wheel in this moment an additional movement directed against the platen, so that the type wheel strikes the platen, and means whereby after the printing has been effected the movement of the type wheel releases the blocking lever and the ratchet.

8. A printing machine particularly adapted to be used in combination with statistical machines for perforated cards and the like, comprising a platen, a type wheel mounted on a support in a plane substantially at right angles to the axis of said platen, a ratchet mounted freely on a stationary axis and having an operative rotative connection with said type wheel, means for stopping said ratchet when a selected one of the types of the type wheel passes the printing position, means for imparting such translatory movement to said type wheel when the said ratchet has been

stopped, that the movement of the selected type in relation to the platen in a certain moment is zero, means for giving the type wheel in this moment an additional movement directed against the platen, so that the type wheel strikes the platen, means whereby the support of the type wheel is returned to its initial position, and means whereby this movement during its last phase is braked to prevent the violent stopping of the support.

9. A printing machine particularly adapted to be used in combination with statistical machines for perforated cards and the like, comprising a platen, a type wheel mounted in a plane substantially at right angles to the axis of said platen, a ratchet mounted freely on a stationary axis and having an operative rotative connection with said type wheel, means for stopping said ratchet when a selected one of the types on the type wheel passes the printing position, means for imparting such translatory movement to said type wheel when the said ratchet has been stopped that the movement of the selected type in relation to the platen in a certain moment is zero, means for giving the type wheel in this moment an additional movement directed against the platen, so that the type wheel strikes the platen, and means for permitting the type wheel to spring back in the very moment it hits the paper.

10. A printing machine particularly adapted to be used in combination with statistical machines for perforated cards and the like, comprising a platen, a type-wheel mounted on a movable support in a plane substantially at right angles to the axis of said platen, a ratchet mounted freely on a stationary axis and having an operative connection with said type-wheel, a blocking lever supported for movement into mesh with said ratchet, means whereby the type-wheel support is displaced when said ratchet is arrested, and means for maintaining the blocking lever in its position when it has come into mesh with said ratchet.

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