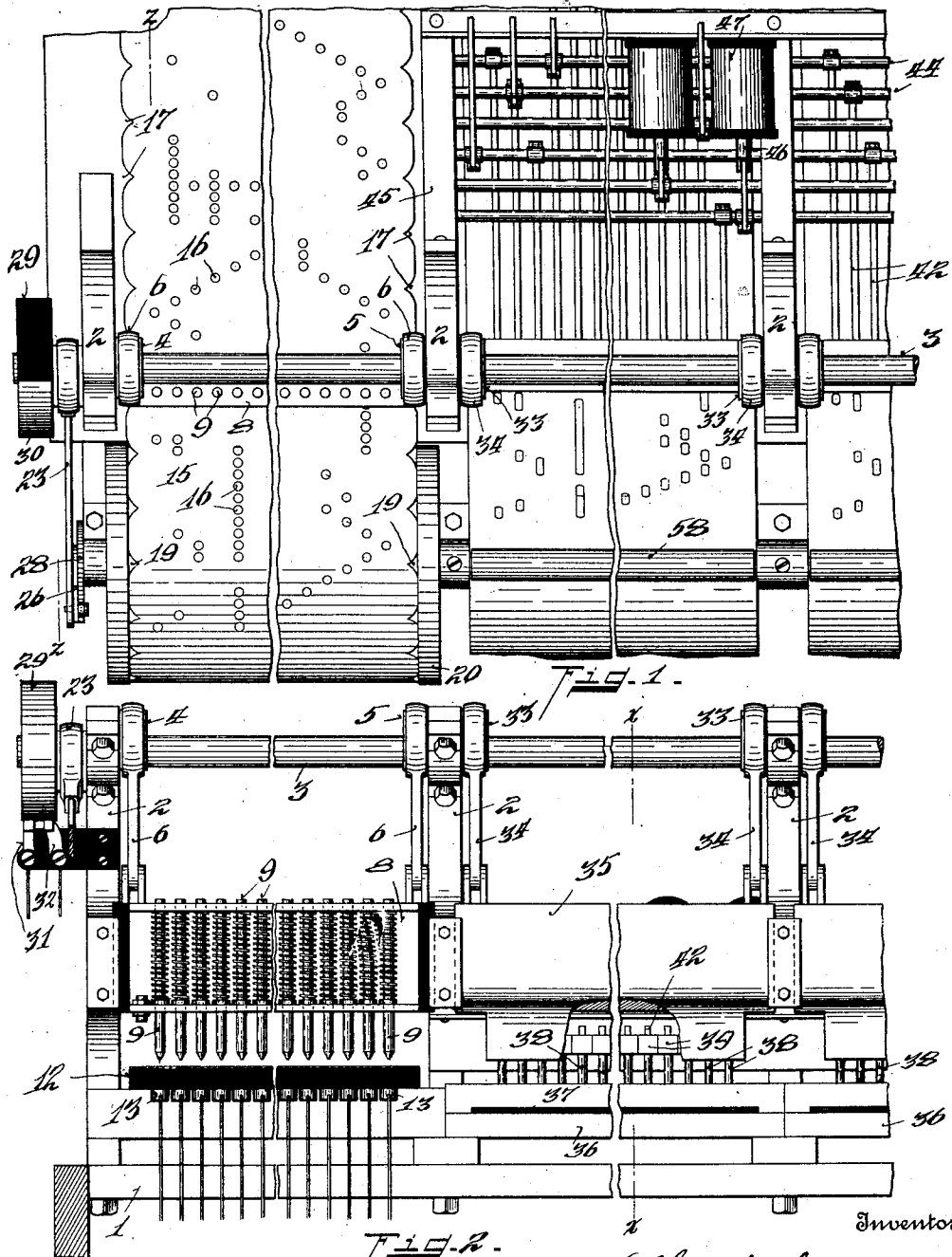


A. J. SWING.
PERFORATING MACHINE.
APPLICATION FILED MAR. 28, 1910.

983,254.

Patented Jan. 31, 1911.

2 SHEETS-SHEET 1.



Witnesses

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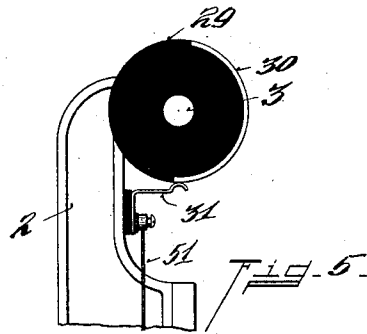
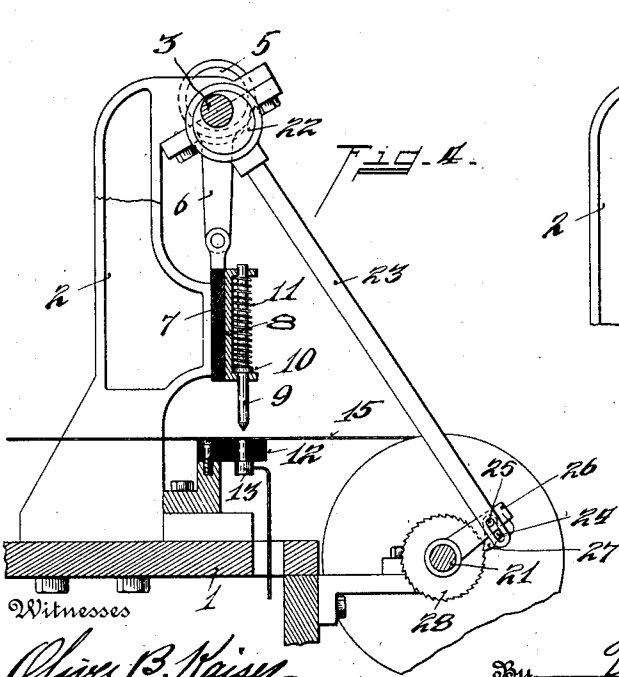
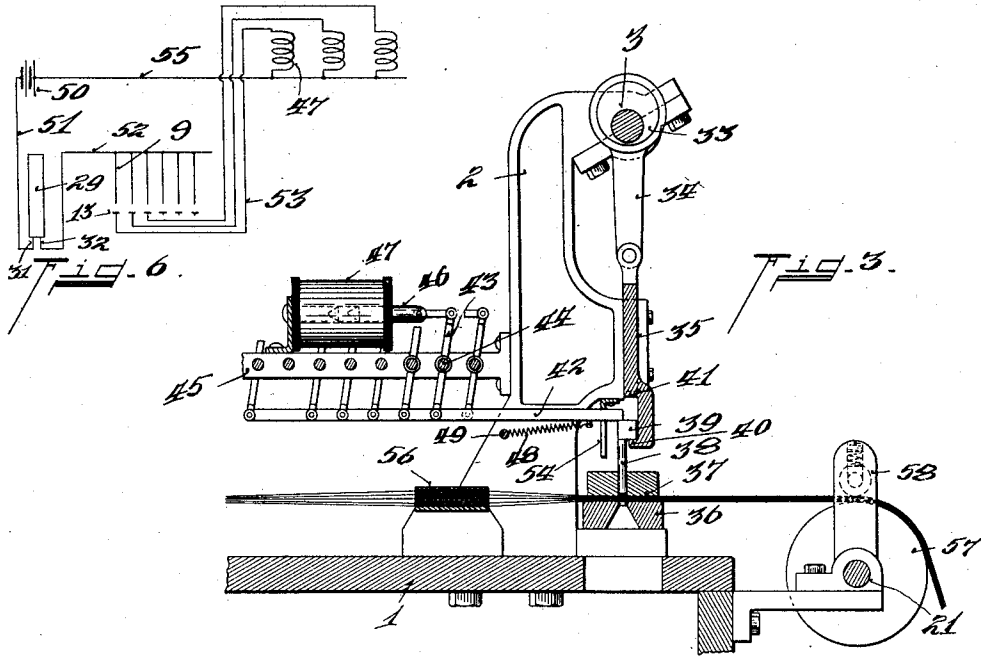
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UNITED STATES PATENT OFFICE.

ALFRED J. SWING, OF CINCINNATI, OHIO, ASSIGNOR OF ONE-HALF TO JOHN SOFGE, OF CINCINNATI, OHIO.

PERFORATING-MACHINE.

983,254.

Specification of Letters Patent.

Patented Jan. 31, 1911.

Application filed March 28, 1910. Serial No. 552,074.

To all whom it may concern:

Be it known that I, ALFRED J. SWING, a citizen of the United States, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Perforating-Machines, of which the following is a specification.

My invention relates to a machine for perforating continuous strips of paper in series synchronously, in the manufacture of record strips for automatic musical instruments.

One of the objects of my invention is to provide means for controlling the operation of a series of punch-members electrically through the feed of a perforated master sheet, whereby synchronous action can be had upon a series of multiple strips of paper.

Another object of my invention is to provide a series of make and break electric circuit contact members, between which a perforated master strip is fed, with means for constantly reciprocating one of the make and break members, and means for pre-determinably, initially breaking the circuit prior to the separation of the serial make and break contact members.

Another object of my invention is to provide a constantly actuated plunger cross-head, for operating a series of punch-members, with means interposed between said plunger and punches electrically controlled for independently operating each punch-member of the series.

Various features of my invention are more fully set forth in the description of the accompanying drawings, forming a part of this specification, in which:—

Figure 1 represents a top plan view of my music-sheet perforation machine, illustrating the master-sheet and a portion of the punch controlling mechanism of the several series of the punch members of one perforating set. Fig. 2 is a front elevation thereof with the feed roll omitted. Fig. 3 is a section on line *x, x*, Fig. 2. Fig. 4 is a section on line *z, z*, Fig. 1. Fig. 5 is a detailed side elevation of the supplemental circuit controlling switch. Fig. 6 is a diagrammatic view of the wiring scheme.

In the drawings, I have illustrated only that portion of the machine controlling the perforating mechanism of one of the series of multiple strips of paper or set, but in

which the machine is capable of simultaneously operating upon a series of multiple sheets or strips of paper, without departing from the general features of my invention.

1 represents the base frame of the machine.

2 represents the journal brackets or supports vertically supported upon said base, the brackets intermediately disposed, serving to support reciprocating mechanism upon each side thereof.

3 represents the main driving shaft journaled in bearings formed in the supports 2, said shaft being driven from any suitable source.

4, 5, represent eccentric disks fixed to the shaft 3, carrying the pitman levers 6 pivotally connected to the cross-head plunger 7, slidably mounted in ways formed between two of the supports 2.

As illustrated, the pitmen are preferably connected at each end of the cross-head plunger.

8 represents a plate secured to the cross-head plunger and preferably insulated therefrom to avoid the short circuiting of the electric circuit, said plate being provided with top and bottom flanges supporting a series of vertically movable switch members, adapted to be reciprocated with the cross-head plunger. The switch members comprise a series of pins 9, projected through the flanges of the plate 8, each having a collar 10, adapted to engage against the inner face of the lower flange of the plate 8, and a coiled spring 11 interposed between said collar 10 and upper flange, for maintaining the free ends or contact ends under tension downwardly. 12 represents an insulator plate horizontally supported beneath the cross-head plunger, provided with a series of contact members 13, in respective alinement with the contact pins 9 carried by the cross-head plunger. Thus, upon a downward movement of the plunger, the contact pins 9 will engage with their respective contact members 13, completing an electric circuit through the same. Each set of contact members being in circuit with a respective electro-magnet for controlling the punch-operating mechanism, to be hereinafter described.

15 represents a master strip of paper provided with the perforations 16, arranged requisitely for a given musical production

or composition, said strip serving as a guide for synchronously operating upon a series of multiple continuous strips of paper for reproducing a given musical composition or record. The master strip is preferably provided with the marginal notches 17, upon each edge thereof, adapted to engage with coincidently shaped lugs or projections 19 formed on the periphery of the feed roller 20, fixed to a feed shaft 21, said shaft extending horizontally across the machine to receive the feed roller of a series of strips. Said shaft is fed as follows:—22 represents an eccentric disk fixed to the shaft 3, and 23 a pitman lever mounted on said disk 22, its free end provided with an oblong slot 24, through which a pin 25 projects, said pin is fixed to the pawl lever 26, loosely pivoted on the feed shaft 21. 27 represents a pawl pivoted to the pawl lever 26, adapted to engage with the teeth of the ratchet wheel 28, fixed to the feed shaft 21. Thus, upon each reciprocation of the pitman 23, the ratchet wheel 28 will be fed forward one tooth or more, as desired.

It is desirable to have the electric circuit passing through the contact members 9, 13, broken in advance of the break between said members, in order to avoid sparking at such point and thereby prevent injury to the master sheet and oxidation of contact members, which, if continued, would produce a scale of non-conducting substances, preventing a circuit being formed. This is accomplished as follows:—29 represents a break wheel fixed to the main shaft 2, provided with a contact plate 30, segmentally extended around the periphery of said break wheel 29, see Fig. 5; and 31, 32 represent contact fingers engaging against the periphery of said break wheel 29, said fingers being short-circuited when they engage over the contact plate 30, closing the partial circuit to the contact members 9, 13; this contact being so arranged relative to the rotation of the main shaft 3, controlling the reciprocation of a circuit controlling plunger, so as to break the electric circuit to the contact members 9, 13, in advance of an upward disengaging movement of the pin 9, away from the contact member 13. It is obvious, however, that various means may be employed for producing a non-arcing or sparking break, without departing from the features of my invention. Further, the reciprocation of the contact members and the master sheet feed are intermittent relative to each other, that is, the master sheet is at rest during the engaging period of the contact members 9, 13, thereby preventing any rubbing action upon the master sheet tending to injure it or enlarge the perforations. It is obvious, however, that this intermittent feed relative to the reciprocation of the contact members, may be variously modified,

without departing from the features of my invention.

33 represents eccentric disks fixed to the main drive shaft 3, each carrying a pitman 34, pivotally connected to the cross-head plunger 35, sliding in ways formed between a second set of vertical supports 2, said plunger simultaneously reciprocating with the plunger 7.

36 represents a stationary punch-member supported upon the frame 1, beneath the cross-head plunger 35, provided with an intermediate paper feeding slot 37, between which multiple strips of paper are fed and perforated, said slot extending horizontally the width of the paper.

38 represent movable punch-members projected into the punch orifices formed with stationary punch-member 36, with each member provided with a head-plate 39, projected forwardly and adapted to be engaged by a flange 40, formed on the plunger 35, in one movement of the plunger.

41 represents a shoulder formed upon the plunger 35, adapted to engage with the individual punch member connecting bars 42, in the downward movement of the plunger, when the connecting bars are moved under or in line with the path of shoulder travel, to impart downward movement to the movable punch members 38. These connecting bars 42 are individually controlled electrically by means of electro-magnets when the same are respectively thrown into circuit through the connections of the make and break contact members carried by or controlled by the plunger 7. A punch operating bar 42 is provided for each of the movable punch-members of the series, the number required being equal to the range to accommodate for various notes in a musical composition or actions of a musical instrument.

As illustrated in the drawings, each punch bar 42 is actuated preferably by a solenoid-magnet and lever mechanism, in which an individual magnet operates the given punch member of all the sets of the series, and in which the electric circuit to each magnet is controlled individually by a given make and break contact member, heretofore described, mounted upon the plunger 7.

All of the magnets and actuated mechanism thereof are similarly constructed and operated, in which:—A respective bar 42 is connected to a lever 43, fixed upon a rock shaft 44, suitably journaled in bearings 45, horizontally across the machine to receive the lever of the different sets of perforating mechanism of the series to simultaneously actuate a given punch bar 42. One of the levers 43 is pivotally connected to an armature rod 46, movable within the core of its magnet 47. 48 represents a spring, one end of which is fixed to a punch-bar 42, the op-

posite end upon a stationary rod 49, said rod being capable of receiving all the springs of the punch bars of the series. The rock shafts 44 are arranged parallel with each other and the number required being equal to the number of punch-members of a given series of the machine, and the magnets being arranged staggeringly relative to each other or in any other compact form to operate its individual punch-bar for a given series.

The electric circuit to each of the magnets is illustrated in the diagrammatic view, Fig. 6, in which:—50 represents a source of electric supply, 51 a wire connected to one pole thereof to the contact member or break finger 31, a partial circuit being made and broken through the revolution of the break wheel 29, from whence the circuit is conveyed through the break finger 32, contacting with the break wheel 29, and wire 52 connecting in multiple the reciprocating contact pins 9. 53 represents a wire connected with one of the contact members 13, to one pole of a given magnet 47, of the series of magnets, while the opposite pole of the magnet is connected to a wire 55, forming a main feed wire in connection with the opposite pole of the source of supply, which wire connects in multiple one pole of all the magnets. The wiring scheme of all the magnets being similar in connection with respective make and break members 9, 13, so as to individually control each magnet upon the completion of the partial circuit thereto.

It is desirable to separate the punch bars 42 of the series from each other, to prevent contact or engagement between the same, and this is accomplished by means of a spacing bar or plate 54, provided with notches through which the punch-bars 42 project. In the operation of a given punch member 38, assuming that its magnet has been energized, the bar 42 will be moved forward beneath the shoulder 41, of the plunger 35, and engage therewith in the downward travel of said plunger, moving the punch member 38 to perforate the paper. In the normal position of the punch bars 42, their shoulder engaging end will lie in rear of the travel of the shoulder, avoiding downward pressure of the punch member 38 in the reciprocation of the plunger. Thus, it will be seen that individual actuation of the punch-members is had upon the reciprocation of the plunger.

In feeding multiple strips of paper beneath the punch member, it is desirable to pass each sheet individually between alining mechanism, separating the sheets at such point from each other, thereby preventing the lateral displacement of one sheet over the second. This is accomplished by means of a horizontal guide plate 56, supported in rear of the throat of the stationary punch

member 37, said guide plate being of laminated form, providing intermediate spaces through which a given sheet passes, separating one from the other and individually alining each sheet relative to the throat of the stationary punch member, through which they are collectively fed, passing between the feed rollers 57, 58, roller 57 being mounted upon the feed shaft 21, while roller 58 is yieldingly journaled against the periphery of roller 57 to provide a frictional feed. This feed may be variously modified and does not form a special feature of this invention.

As illustrated, the feed rollers 57 of the series are of smaller diameter than the master sheet feed roller 20, to provide a differential ratio of speed between the two, enabling the production of an elongated perforation, denoting the value of a note, instead of producing or reproducing the serial perforations for a given value of a note, as that of the master sheet. Such elongated perforations when the record sheet is in use produces a prolonged action according to the value of the note, which could not be obtained in the serial perforations for the value of a given note formed in the master sheet, but are more desirable in the master sheet in a proper reproduction of a record.

Having described my invention, I claim:—

1. In a machine of the class described, a master record, means for intermittently feeding the same, a series of reciprocating contact members, a series of stationary contact members, between which said master sheet travels for controlling an electric circuit between said contact members, a punch operating plunger, a series of movable punch-members, and means in circuit respectively with said contact members for individually engaging said punch-members with the plunger for perforating a strip of paper.

2. In a machine of the class described, a master record strip, a series of reciprocating contact members, a series of respective stationary contact members between which said record strip travels, and provided with perforations for controlling an electric circuit through said contact members, means for reciprocating one set of contact members, a punch plunger simultaneously operated with said contact reciprocating means, a series of movable punch members normally disengaged from said plunger, and means electrically operated through the completing of a partial circuit through said contact members, adapted to move into position between plunger and punch members for synchronously operating said punch members individually upon the closing of the circuit of the respective contact members, and means for feeding a record strip and strip to be perforated intermittently upon the upward reciprocation of said contact members.

3. In a machine of the class described, a master record strip, a series of electric circuit controlling means, means for reciprocating the same, means for feeding said record strip intermittently upon an upward reciprocating stroke of the contact members, said record strip provided with means for controlling a connection between the contact members for completing an electric circuit individually through given contact members.
4. In a machine of the class described, a main driving shaft; a series of movable, coincident, stationary, electric circuit controlling members, means in connection with said driving shaft for operating said movable members of the series, a perforated master sheet fed between said circuit-controlling members, means in connection with said driving shaft for intermittently feeding the master sheet upon a movement of said movable contact members and after the circuit between said controlling members has been broken.
5. In a machine of the class described, a main driving shaft; a series of movable, coincident, stationary, electric circuit controlling members, means in connection with said driving shaft for operating said movable members of the series, a perforated master sheet fed between said circuit controlling members, means in connection with said driving shaft for intermittently feeding the master sheet upon a movement of said movable contact members and after the circuit between said controlling members has been broken, and circuit controlling means in partial circuit with the movable circuit controlling members for initially breaking the circuit to the combined series.
6. In a machine of the class described, means for intermittently feeding a master sheet, and a sheet to be punched, a positively driven make and break electric contact mechanism, comprising an alined series of individual members controlled by the perforation of the master sheet, a positively driven series of punch-members, a corresponding series of punch controlling bars, and means actuated by the make and break contact members for actuating said bars, whereby an alined series of perforations of the master sheet will actuate the corresponding members of the punches.
7. In a machine of the class described, means for intermittently feeding a master sheet, and a sheet to be punched, an alined series of electric make and break contact members, an alined series of punches, an alined series of punch controlling bars, means for positively reciprocating the members of the make and break and of the punch mechanisms, and means whereby the make and break mechanism actuates the punch controlling bars, the master sheet being positioned relative to the make and break mechanism, so that the alined perforations are duplicated by the punch mechanism.
8. In a machine of the class described, a sheet to be perforated, a punch plunger for operating a series of punch-members, means for positively reciprocating said plunger, a series of punch-members normally out of operative connection with said plunger, a master sheet, electric circuit make and break members in partial circuit, with means controlling an individual operative connection of each of the punch members and plungers, whereby an alined series of perforations of the master sheet will actuate the corresponding punch-members.
9. In a machine of the class described, a master sheet and a sheet to be punched, a series of electric contacts, between the opposite poles of which the master sheet travels, a contact being made for each perforation, a reciprocating plunger, a series of punches, and a series of bars adapted to operatively connect and disconnect said punches to said plunger, each of said contact members having electric connections with its appropriate punch controlling bar for operating the punches corresponding to the contacts made through the perforations.
10. In a machine of the class described, multiple sheets to be perforated, a series of punch members normally out of operative position, a single punch actuating means for the series, a master sheet, electric make and break mechanism for each punch-member in partial circuit, with means adapted to throw its respective punch members into operative position with the punch actuating means, said make and break mechanism circuit control governed by relative perforations in the master sheet for synchronous punch actuation, and means in advance of the punch-member for coordinately separating said multiple sheets.
11. In a machine of the class described, multiple sheets to be perforated, a series of punch members normally out of operative position, a single punch actuating means for the series, a master sheet, electric make and break mechanism for each punch-member in partial circuit, with means adapted to throw its respective punch members into operative position with the punch actuating means, said make and break mechanism circuit control governed by relative perforations in the master sheet for synchronous punch actuation, and means in advance of the punch-member for coordinately separating said multiple sheets, and means for intermittently feeding said master sheet between the operative make and break mechanism and punches.
12. In a machine of the class described, a multiple series of sheets to be perforated, a multiple series of punch-members normally out of commission, punch operating means

for each series of punch members, a master
sheet dominant of the various notes of a
composition corresponding in number to the
number of punch members of each series,
5 means interposed between the master sheet
and respective analogous punch-members of
the multiple series for synchronously con-
necting such punch-members of each series
with the operating means therefor, and

means for relatively feeding said master 10
sheet and multiple series of sheets.

In testimony whereof, I have hereunto set
my hand.

ALFRED J. SWING.

Witnesses:

OLIVER B. KAISER,
EMMA SPENER.