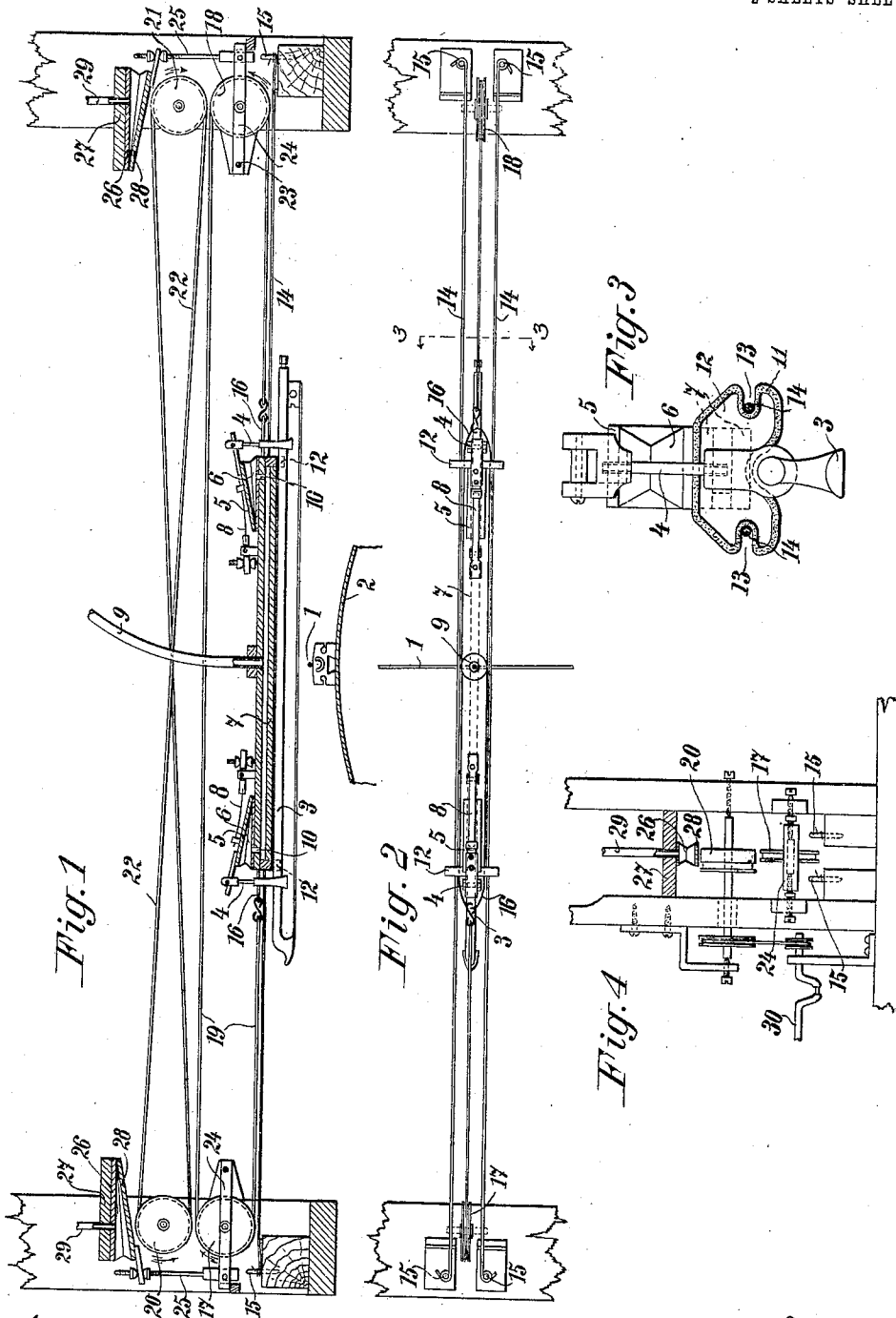


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L. BAJDE.
AUTOMATIC PIANO VIOLIN.
APPLICATION FILED JULY 9, 1910.

Patented May 9, 1911.

2 SHEETS—SHEET 1.



Witnesses
B. Kommers
May Ellis

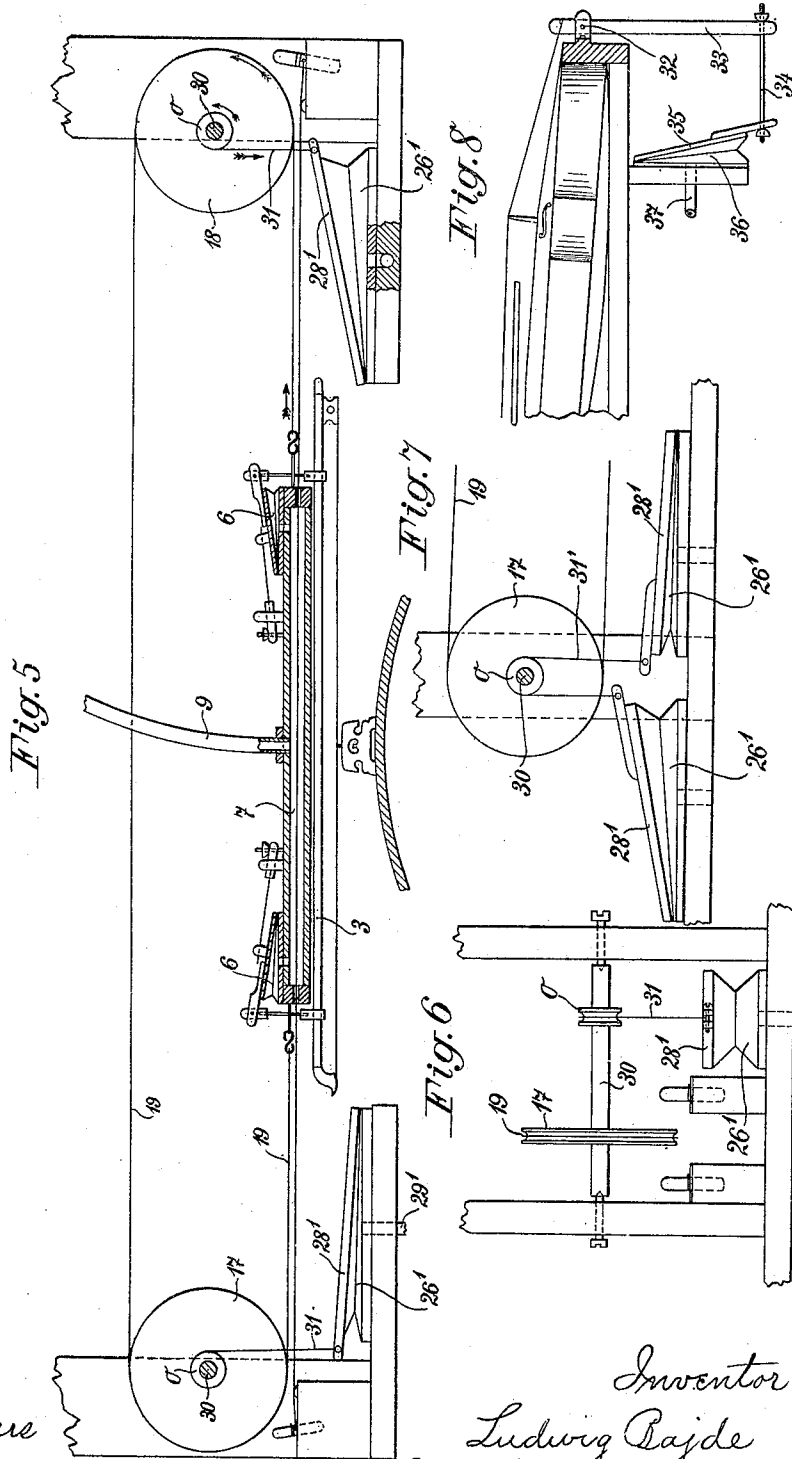
Inventor
Ludwig Bajde
By Henry [Signature] atty.

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UNITED STATES PATENT OFFICE.

LUDWIG BAJDE, OF SCHISCHKA, NEAR LAIBACH, AUSTRIA-HUNGARY.

AUTOMATIC PIANO-VIOLIN.

991,596.

Specification of Letters Patent.

Patented May 9, 1911.

Application filed July 9, 1910. Serial No. 571,200.

To all whom it may concern:

Be it known that I, LUDWIG BAJDE, subject of the Emperor of Austria-Hungary, residing at Schischka, near Laibach, in Carniola, Austria-Hungary, have invented certain new and useful Improvements in Automatic Piano-Violins, of which the following is a specification.

This invention has for its object to provide an apparatus for operating the strings of mechanical bow-instruments having one or more strings, by means of which the strings of the instrument can be operated across their length for producing the bow notes and also along their length for producing tremolo effects. The bow notes are produced preferably by means of an ordinary bow having a stick formed of an iron tube, which is mounted on a carrier and is adapted to be pressed against the string or strings of the suitably supported instrument by means of bellows or the like. The bow carrier is guided longitudinally along two smooth stretched cords or wires and is connected to an endless cord or the like passing over guide pulleys which are adapted to be pressed separately by means of bellows likewise operated by air suction, or the like against friction pulleys which are rotated either temporarily or continuously, for the purpose of causing the bow to make its bowing movement upon the strings. These friction pulleys are conveniently connected together by a crossed cord or the like whereby they are rotated. According as one or the other guide pulley of the cord or the like connected to the bow carrier, is pressed against its respective friction pulley, the bow is thereby caused to move in the one or the other direction. By alternately pressing one or the other guide pulley against its respective friction pulley and removing it therefrom, detached bowing effects in one and the same direction can be produced. Staccato playing can also be executed in this manner. For producing tremolo effects, the string of the instrument is connected to the movable part of a bellows or the like operated by means of the air suction apparatus, whereby the string can be pulled and released alternately by moving the said part of the bellows to-and-fro. In the case of an instrument having several strings, it can be arranged to be rocked on its longitudinal axis, preferably by pneumatic means derived from the aforesaid air suction apparatus, so

as to present any desired string to the bow. The control of the air suction for producing the various positions and movements is effected in the ordinary way by means of a perforated music strip or sheet in a well known manner.

The invention is illustrated in the accompanying drawings in which:

Figure 1 is a side elevation partly in vertical section of one constructional example of the improved bowing apparatus operated by means of friction mechanism, applied to a one-stringed instrument; Fig. 2 is a plan of the same apparatus; Fig. 3 is a cross section on the line 3—3 of Fig. 2, drawn to a larger scale and Fig. 4 is an elevation of a portion of the bowing mechanism. Fig. 5 is a side elevation partly in section and Fig. 6 is an end elevation of a bowing mechanism with direct driving of the bow. Fig. 7 illustrates a modified arrangement of the bellows for actuating the bowing mechanism and Fig. 8 illustrates an arrangement for producing tremolo effects.

As shown, the instrument 2 furnished with a single string 1 is supported on a table or the like and the bowing mechanism is arranged above it, consisting of an ordinary adjustable bow 3 the frame of which is preferably composed of an iron tube for the purpose of avoiding deflection. The bow is fixed to two suspension members 4, 4 capable of being lengthened and shortened, each pivoted to the movable top 5 of a bellows 6. The two bellows 6 are mounted on a hollow box 7 which is arranged parallel to the bow 3 and carries adjustable springs 8. The latter act with their ends upon the movable top 5 of the respective bellows and have a tendency to keep the bellows expanded, in which position the bow 3 is kept raised, that is, away from the string 1. The bellows 6 communicate with each other and with a flexible pipe 9 through which the air can be sucked from the bellows, whereby the latter are caused to collapse in opposition to the action of springs 8, so as to allow the bow 3 by means of its suspension members 4 to be brought down with its horsehair against the string 1. The bellows, preferably communicate through holes 10 with the cavity of the box 7 and the latter communicates with the flexible pipe 9 that is mounted in the top of the said box. The box 7 that constitutes the support of the bowing mechanism carries at its ends wide cross pieces 12 covered with

strips 11 (Fig. 3) of felt or leather and formed with side notches 13 through which pass two parallel guides formed of cords or wires 14 stretched between rotary pegs 15.

5 The box 7 is connected by means of hooks or clips 16 on its ends to a cord or the like 19 passing over guide pulleys 17, 18. The movement of this cord 19 in one or the other direction produces a to-and-fro movement
10 of the entire bowing mechanism along the cords or wires 14 whereby the bow 3 is caused to make its bowing movement, so that if it has been brought against the string 1 by the air having been sucked from
15 the bellows 6 it will cause the string 1 to sound.

In the construction shown in Figs. 1 to 4, the movement of the cord or the like 19 is produced by the following means: Friction
20 pulleys 20, 21 which are rotatable in fixed bearings are arranged above the pulleys 17, 18 and are connected to each other by a crossed cord or the like 22. One of the friction pulleys is rotated permanently in one
25 direction and produces by means of the crossed cord 22 a rotary movement of the other friction pulley in the opposite direction. The pulleys 17, 18 are adjustable separately and, in the example shown, are
30 mounted on levers 24 fulcrumed at 23. According to the guide pulley 17 or 18 is brought against its respective friction pulley 20 or 21, the cord 19 and through it the entire bowing mechanism is moved in the
35 one or the other direction.

The bringing of the guide pulleys 17, 18 against their respective friction pulleys 20, 21 is effected preferably by pneumatic means. For this purpose the levers 24 are
40 connected by means of hanging rods 25 to the movable bottoms 28 of the respective bellows 26 which are mounted on the fixed frame parts 27 and from which the air is sucked through the pipe 29. The upward
45 movement of the parts 28 and 25 due to this suction raises the guide pulleys 17, 18 respectively against the friction pulleys 20, 21. The rotation of the friction pulleys 20, 21 is conveniently derived from the shaft 30
50 of the suction-producing apparatus, as indicated in Fig. 4.

In the construction shown in Figs. 5 to 7, the pulleys 17, 18, contrary to the arrangement shown in Figs. 1 to 4, are mounted to
55 rotate in fixed bearings so that the bow carrier 7 is not subjected to appreciable variations of position in the vertical direction.

On the shaft 30 of each of the two pulleys there is fixed a pulley *o* to which is fastened
60 one end of a cord or the like 31 that, after having been passed one or more times around the pulley *o*, is attached at its other end to the movable part 28' of a bellows 26'. The latter communicates through the pipe 29'
65 with the air suction apparatus. The two

cords 31 are laid around their respective pulleys *o* in such a manner that the operation, that is, the collapse of one bellows causes the bow carrier 7 with the bow 3 to move in one direction, while at the same time the
70 other bellows is expanding and vice versa. The two bellows 26' may also be arranged close together as shown in Fig. 7, for the purpose of avoiding long pipe connections. In such a case the two bellows act upon one
75 and the same pulley *o* around which a cord 31' is passed that is secured thereto at one point and is attached at one end to the movable part 28' of one bellows and at its other end to the movable part of the other bellows.
80

For the purpose of producing tremolo effects the string holder is constituted by the upper end of a lever 33 (Fig. 8) which is fulcrumed at 32 on the support for the instrument and is connected by means of an ad-
85 justable rod 34 to the movable part 35 of a bellows 36. This bellows communicates through a pipe 37 with the air suction apparatus. By alternately sucking the air from
90 the bellows and admitting it into the latter, the string will be stretched and slackened alternately as required for the production of tremolo effects.

The various pneumatic devices (the bellows 6, 26, 26' and 36) are connected by
95 pipes (9, 29 and 37) to an air-suction apparatus of any suitable kind.

The improved bowing apparatus allows of producing various musical effects, such as staccato, pizzicato and tremolo playing, sus-
100 tained or short bow notes, etc.

I claim:

1. The combination with a stringed instrument and a bow for vibrating the strings thereof, of an endless flexible carrier connect-
105 ed with and supporting the bow in operative relation to the instrument, means to reciprocate the carrier, and means to move the bow to and from the strings of the instrument.

2. The combination with a stringed instrument and a bow for vibrating the strings thereof, of an endless flexible carrier connect-
110 ed with and supporting the bow in operative relation to the instrument and pneumatics to move the bow to and from the strings of the instrument.

3. The combination with a stringed instrument and a juxtapositioned bow for vibrating the strings thereof having a rigid frame, of pneumatically operated supports
120 for said frame adapted to press the bow onto the strings, a flexible member carrying the frame and supports, and means to reciprocate the carrier.

4. The combination with a stringed instrument and a juxtapositioned bow for vibrating the strings thereof having a rigid frame, of pneumatically operated supports for said
125 frame adapted to move the bow to and from the strings, a flexible member carrying the

frame and supports, supports for the flexible member, and means to oscillate the latter supports to reciprocate the flexible member.

5. The combination with a stringed instrument and a juxtapositioned bow adapted to engage the strings thereof having a rigid frame, of a bow support comprising a box, an air conduit communicating with the latter, bellows communicating with the box and connected to the bow frame, and means for reciprocating the bow support.

6. The combination with a stringed instrument and a juxtapositioned bow adapted to engage the strings thereof having a rigid frame, of a bow support comprising a box, an air conduit communicating with the box, bellows connected to the bow frame and communicating with the box, a flexible member connected with the box, pulleys on which the flexible member is mounted, and means to oscillate the pulleys.

7. The combination with a stringed instrument and a juxtapositioned bow adapted to vibrate the strings thereof having a rigid frame, of a bow support comprising a box, an air conduit communicating with the box, bellows connected to the bow frame and communicating with the box, a flexible member connected with the box, pulleys on which the flexible member is mounted, and pneumatically operated means for oscillating the pulleys.

8. The combination with a stringed instrument and a juxtapositioned bow, of pneu-

matically operated supports to move the bow to and from the strings, a flexible carrier for the supports, and pneumatically operated means to reciprocate the carrier.

9. The combination with a stringed instrument and a juxtapositioned bow for vibrating the strings thereof, of pneumatically operated supports to move the bow to and from the strings, a flexible carrier for the supports, pulleys on which the flexible carrier is mounted, pneumatics, and flexible members connecting the latter with the pulleys.

10. The combination with a stringed instrument and a juxtapositioned bow adapted to vibrate the strings thereof having a rigid frame, of a bow support comprising a box, a flexible air conduit communicating therewith, a bellows at each end of and communicating with the box, rods connecting the movable parts of the bellows to the bow frame, parallel guides for the box, a flexible member connected to the latter, pulleys carrying the flexible member, and pneumatics flexibly connected to the pulleys adapted to oscillate the latter to reciprocate the flexible member.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

LUDWIG BAJDE.

Witnesses:

JOSEF RUBERNE,
AUGUST FUGGER.