

June 1, 1926.

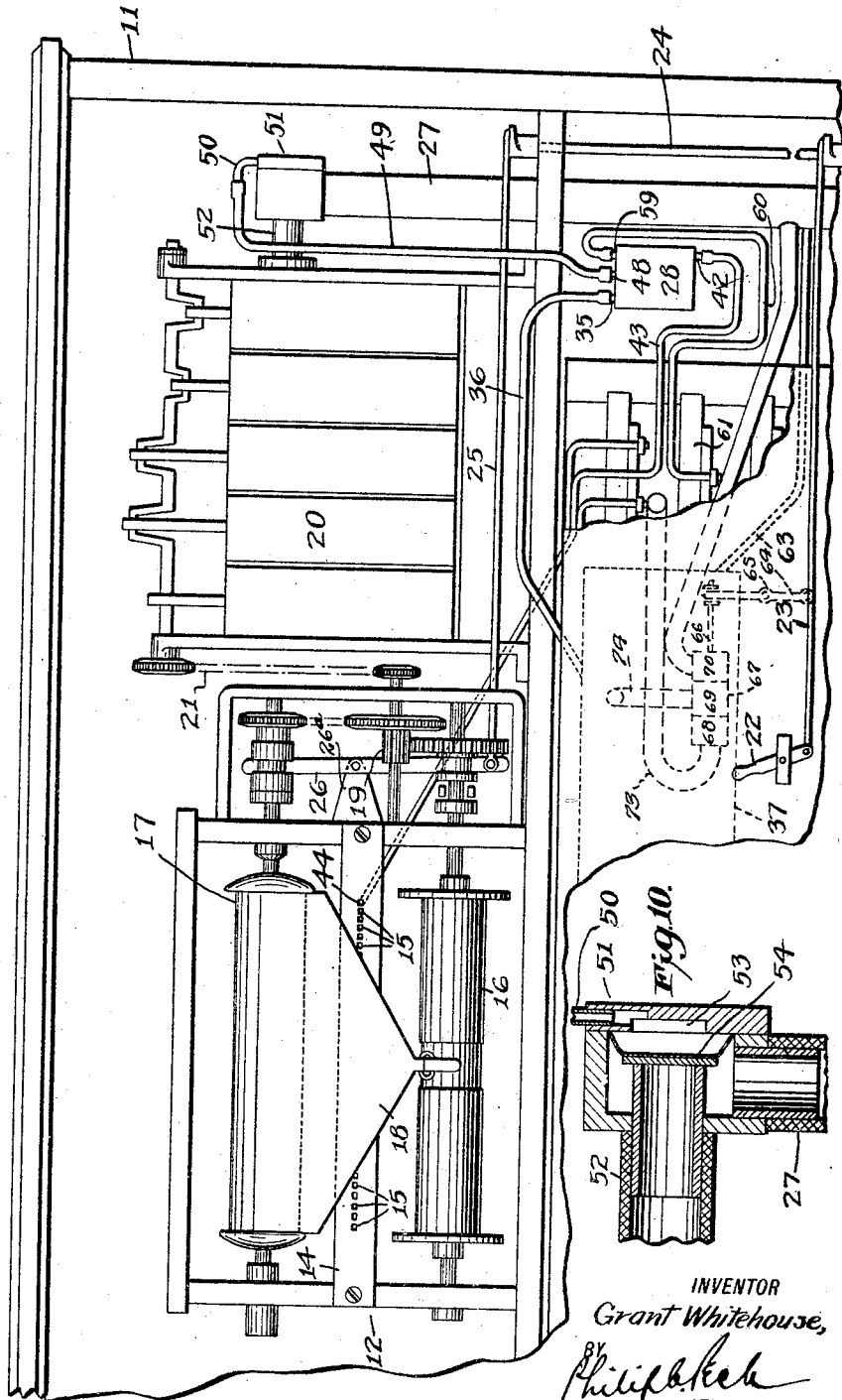
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MECHANICAL MUSICAL INSTRUMENT

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Fig. 1.



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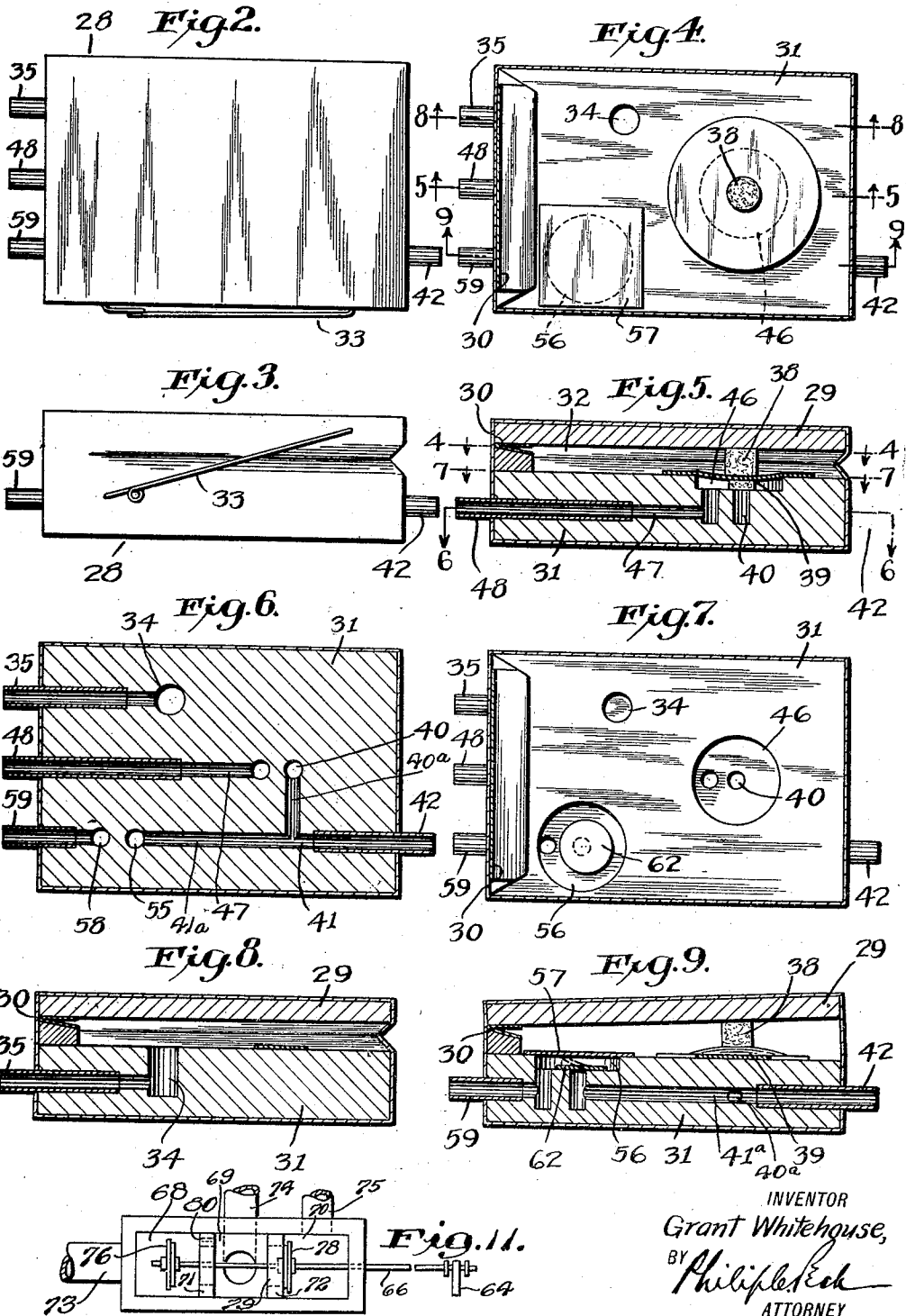
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Filed Nov. 29, 1922

2 Sheets-Sheet 2



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# UNITED STATES PATENT OFFICE.

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## MECHANICAL MUSICAL INSTRUMENT.

Application filed November 29, 1922. Serial No. 603,908.

My invention relates generally to pneumatically-operated musical instruments, such as player-pianos, organs and other musical instruments of the well-known type in which a perforated music-sheet is caused to travel over a tracker-bar formed with a series of air-ducts connected with the playing devices, and my improvements relate particularly to the music-sheet winding and re-winding mechanism by which the instrument is operatively controlled, and with novel devices controlled by the position of the music-sheet on the tracker-bar for terminating the operation of such re-winding mechanism.

The objects of my invention are, among other things, chiefly to provide a simple, efficient and automatic means connected with any selected one of the customary note-controlling air-ducts in the tracker-bar normally used for operating the playing devices, which will immediately terminate the operation of the motor for re-winding when the sheet has travelled backwardly off the tracker, thereby avoiding, among other things, the undesirable slapping noise caused by the rapid revolution of the forward end of the music-sheet against the tracker box after such end has become disengaged from the catch in the take-up roll. Heretofore it has been proposed to use special air-ducts in the tracker to control such winding and re-winding mechanism usually cut outside the range of the 88 notes, or to block off and use exclusively for such control one of the 88 note music-ducts, generally one of the outside ducts.

By my improvements any one of the customary 88 note air-ducts in the tracker may be operatively connected with my improved control device to accomplish an instantaneous shut-off for the motor on the rewind when the paper leaves the tracker-bar thereby exposing a sufficient number of air-ducts to equalize the exhaust pressure between the pumping bellows and action wind-chest and without affecting the use of such air-duct in controlling the playing of the particular note in the musical composition in the forward run of the music-sheet over the tracker-bar.

A further object of my invention is to provide a simplified yet instantaneously effective shut-off valve for the motor-rewind, located in the main wind-trunk, the action of

which is inaugurated by the automatic control device hereinbefore referred to, so that the motor may not undesirably overrun but is always under the direct control of the music-sheet as it travels back over the tracker-bar.

With the foregoing and other objects in view, the invention comprises the features of construction, the parts and combinations thereof and the mode of operation as hereinafter described and then particularly pointed out in the appended claims.

Of the drawings, Fig. 1 is a front elevation of a player-piano with parts broken out and the front casing removed which illustrates an embodiment of the invention in a diagrammatic way;

Fig. 2 is an enlarged plan view of the pneumatic containing the valve mechanism;

Fig. 3 is a side elevation of the pneumatic shown in Fig. 2;

Fig. 4 is a section plan view taken on the line 4—4 of Fig. 5 looking in the direction of the arrows;

Fig. 5 is a longitudinal sectional view taken on the line 5—5 of Fig. 4;

Fig. 6 is a sectional plan view taken on the line 6—6 of Fig. 5;

Fig. 7 is a sectional plan view taken on the line 7—7 of Fig. 5;

Figs. 8 and 9 are longitudinal sectional views taken on the lines 8—8, 9—9 of Fig. 4 respectively; and

Fig. 10 is an enlarged detail view in section showing the valve for shutting-off the motor connection with the main exhaust; and Fig. 11 is an enlarged detail view of the gate-box shown in Fig. 1.

Similar numerals refer to similar parts throughout the several figures.

Referring to Fig. 1, the player-piano which is chosen for a preferred embodiment of the invention may be of any usual or suitable construction, comprising, so far as shown, the frame and supporting case 11, the tracker-box 12 with the tracker-bar 14 provided with the customary row of note-controlling air-ducts 15 on its face. Journalled in the tracker-box 12 are the take-up roll 16 and the music roll 17, the latter carrying the music sheet 18. Operatively connected with the take-up roll 16 and music-roll 17 is the gearing 19 driven from the motor 20 by the sprocket chain 21 in the usual manner. The gearing 19 is shifted

by the rewind lever 22 for winding and re-winding the music-sheet 18 in the customary manner, except as hereinafter set forth, the present improvements not directly relating with the structural details, arrangement and operation of such devices. As shown in Fig. 1 the rewind lever 22 is connected by the link 23 to the rock-shaft 24 which actuates the rod 25 to move the clutch-shifting lever 26 pivoted on the bracket 26<sup>a</sup> fastened to the tracker-box 12 by which the motor 20 is operatively connected either with the take-up roll 16 or with the music-roll driver for rewinding the music-sheet 18 from the take-up roll 16 back onto the music-roll 17. The motor 20 is connected by the main wind-trunk 27 with the customary pumping bellows (not shown) which produce the required exhaust or vacuum pressure used as the motive power in the player-piano.

To control the action of the motor 20 from the music-sheet 18 upon the rewind of the latter over the tracker-bar 14, I have devised the following mechanism which is shown in detail in Figs. 2-10, the location thereof in the case 11 being illustrated in Fig. 1. Such mechanism comprises the pneumatic 28 having the movable leaf 29 hinged at 30 to the body 31 of the pneumatic (Figs. 5, 8 and 9) in the usual manner to form the main chamber 32. The spring member 33 (Fig. 3) secured to the leaf 29 and body 31 normally tends to raise the leaf 29 to its Fig. 9 position; and the chamber 32 is connected through the port 34, nipple 35 and tube 36 with the wind-chest 37 (shown diagrammatically in Fig. 1) to hold the leaf 29 in its collapsed Fig. 5 position against the tension of the spring 33 when the player action is rendering the selection by the forward travel of the music-sheet 18 over the tracker-bar 14. Upon the under side of the leaf 29 is affixed the felt button 38 attached to the punch-valve 39 formed of leather or other flexible material which is adapted to open and close the port 40 (Figs. 5 and 7) connected by the passage 40<sup>a</sup> through the conduit 41 (Fig. 6) to the nipple 42 connected by the tube 43 to any selected, in this embodiment, the outer air-duct 44 in the tracker-bar 14 (Fig. 1). The valve chamber 46 is connected by the conduit 47 with the nipple 48 on which the tube 49 is secured leading to the nipple 50 in the valve-box 51 (Fig. 1).

The interior of the valve-box 51 is shown in Fig. 10; such box is mounted on the wind-trunk 27 and fits over and encloses the outer end of the pipe 52 leading to the motor 20. The side of the box 51 opposite the pipe 52 is formed with the recessed chamber 53 and the punch-valve 54 is affixed across the top of the chamber 53 and is adapted to close the pipe 52 when atmos-

pheric pressure is admitted to the chamber 53 through the nipple 50 and tube 49.

Referring to Figs. 6 and 9, the conduit 41 is extended through the body 31 in alignment with the nipple 42 to form the passage 41<sup>a</sup> connected with the vertical port 55 opening into the circular recessed chamber 56 sealed from the main chamber 32 by the disk 57. Adjacent the port 55 is a similarly-cut port 58 connected to the nipple 59 on which the tube 60 is fastened to communicate with the usual action pneumatic 61 employed for sounding the last note in the key-board corresponding with the air-duct 44. The flap valve 62 is secured to the floor of the chamber 56 and is adapted to close the port 55 so as to break the connection between the pneumatic 61 and the note duct 44 during the rewind. When the valve 62 is in its open position (shown by dotted lines in Fig. 9), a direct exhaust connection is maintained between the nipple 42 and the nipple 59 to enable the action pneumatic 61 to sound the proper note in the musical composition when the note duct 44 is uncovered by its registering perforation in the music-sheet 18. As shown in Fig. 1 the wind-trunk 27 has a supplementary tube 63 of small size connected with the wind-chest 37, so that the chamber 32 in the pneumatic 28 may be under a slight air tension sufficient to hold the leaf 29 collapsed at all times during the rewind (irrespective of any uncovering of the note duct 44 by the music-sheet), until the music sheet 18 has reached the position shown in Fig. 1 so that a sufficient number of ducts 15 along with the duct 44 have been uncovered to break the vacuum exhaust in the corresponding player actions to allow the spring 33 to lift the leaf 29 and raise the valve 39 which inaugurates the action of the motor shut-off control.

Referring to Figs. 1 and 11 the link 23 has pinned thereto the lower end of the rock-lever 64 fulcrumed on the stud 65 with the upper end of the lever 64 slidably connected with the outer end of the valve-rod 66 which is actuated in the gate-box 67. This gate-box 67 is divided into three separate chambers 68, 69, and 70 by the partitions 71 and 72 respectively. The left-hand chamber 68 (Fig. 11) is connected by the pipe 73 to the usual action pneumatic chamber for the action pneumatics 61, while the middle chamber 69 is connected by the pipe 74 to the wind-chest 37. The right-hand chamber 70 is connected by the pipe 75 to the wind trunk 27, all as shown in Fig. 1. Within the chamber 68 is the valve 76 fastened to the inner end of the rod 66 which valve is adapted to open and close the port 77 formed in the partition 71; within the chamber 70 is the valve 78 fastened to the rod 66 to open and close the port 79 formed in the partition 72. A bleed passage 80 is also cut in

the partition 71 as shown in Fig. 11. The valves 76 and 78 are so spaced on the rod 66 that in one position the valve 76 opens the port 77 while the valve 78 closes the port 79 (Fig. 11), and in another position the relative position of the valves 76 and 78 is reversed to close the port 77 and open the port 79 respectively. During normal playing these valves 76 and 78 are positioned as shown in Fig. 11 with the wind-chest 37 directly connected with the action pneumatics 61 and the wind trunk 27 shut off from the wind-chest 37. During the rewind when the lever 22 has moved the link 23 to the left (Fig. 1), the valve-rod 66 is actuated through the rock-lever 64 to shift the positions of the valves 76 and 78 so as to cut off the chamber 68 from the wind-chest 37 by the closing of the port 77, while the port 79 is opened by the valve 78 thereby connecting the wind-chest 37 only with the wind-trunk 27 with a slight exhaust pressure maintained in the chamber 68 and action pneumatics 61 through the bleed opening 80.

The operation of my improved control device during the travel of the music-sheet 18 over the tracker-bar 14 during the wind and rewind is substantially as follows. When the player actions are rendering the musical selection according to the perforations in the music-sheet 18, the leaf 29 is collapsed by the exhaust connection through the nipple 35 with the wind-chest 37 against the force of the spring 33. The collapsed leaf 29 forces and holds the valve 39 against the port 40 which shuts off communication between the nipple 42 connected with the air-duct 44 in the tracker 14 and the nipple 48 connected by the tube 49 with the nipple 50 communicating with the chamber 53 in the valve-box 51 to hold the valve 54 away from the orifice of the pipe 52 leading to the motor 20. Such valve 39, therefore, maintains a normal operative exhaust connection between the tracker duct 44 and its corresponding action pneumatic 61 to operate the note corresponding with the last note on the key-board as the musical composition is being played according to the perforations in the music-sheet, and the motor 20 is under operative exhaust connection with the wind-trunk 27.

However, when the handle of the rewind lever is moved to the right (Fig. 1) to shift the gearing 19 for rewinding, the valve-rod 66 is also moved to the right through the link 23 and rock-lever 64 to cut off, as has been hereinbefore described, the wind-chest 37 from the series of action pneumatics comprising the player action, of which the pneumatic 61 is one, while at the same time the opening of the valve 78 (moved to the right) in the gate-box 67 provides a direct connection from the wind-chest 37 through the chamber 69, port 79 chamber 70 and pipe 75 to the wind trunk 27 and motor 20 for the music-roll rewind. Meanwhile during such rewind the suction exhaust is maintained in the chamber 32 of the pneumatic 28 from the wind-chest 37 through the tube 36, nipple 35 and port 34 as hereinbefore described, only until the music-sheet 18 leaves the tracker-bar 14. When this music-sheet 18 reaches the position shown in Fig. 1, the exhaust tension in the chamber 32 is broken by the equalization to atmospheric pressure derived through a series of tracker air-ducts 15 through the action pneumatics 61, wind-chest 37, tube 36 and nipple 35. Instantly the leaf 29 is raised by the spring 33 which also lifts the valve 39 from the port 40 thereby connecting the chamber 46 through the passage 40<sup>a</sup> and conduit 41 with the nipple 42 connected by the tube 43 with the tracker opening 44; at the same time the chamber 46 is connected to the conduit 47, nipple 48 and tube 49 with the chamber 53 (Fig. 10) of the valve-box 51 through the nipple 50, thereby breaking the exhaust pressure in this chamber 53 which holds the valve 54 away from the orifice of the pipe 52 as hereinbefore explained. Thereupon atmospheric pressure in this chamber 53 immediately forces the valve 54 against the pipe 52 as shown in Fig. 10 which causes the stoppage of the motor 20 by cutting off the operative suction connection normally maintained throughout the wind-trunk 27 by the pumping bellows (not shown).

The foregoing construction embodies the underlying principles of my invention, but various changes or modifications may be made in the structural details and arrangement of the parts without departing from the scope of my improvements. However, the foregoing is sufficient to disclose the basic principles and advantages of my invention as installed in a player-piano to attain an automatic and instantaneous stopping of the motor upon the rewind of the music sheet.

I claim as my invention:

1. In a mechanical musical instrument controlled by a perforated music-sheet and tracker-bar, a music-sheet winding device, a pneumatic motor to actuate same, a source of exhaust pressure to operate said motor, a tracker-bar having air-ducts therein controlling separate action pneumatics, and a valve held open by said exhaust pressure during the forward travel of the sheet to close and stop the motor after the rewind, said valve being actuated when the music-sheet uncovers a sufficient number of said air-ducts upon leaving the tracker-bar to equalize the exhaust pressure through said action pneumatics.

2. In a mechanical musical instrument controlled by a perforated music-sheet and

tracker-bar, a music-sheet winding device, a pneumatic motor to actuate same, a source of exhaust pressure to operate said motor, a tracker-bar having air-ducts therein controlling separate action pneumatics, and an independent pneumatic valve normally held open through exhaust pressure by the music-sheet during its forward travel across the tracker-bar to close and stop the motor after the rewind, said valve being actuated when the music-sheet uncovers a sufficient number of said air-ducts upon leaving the tracker-bar to equalize the exhaust pressure through said action pneumatics.

3. In a mechanical musical instrument controlled by a perforated music-sheet and tracker-bar, a music-sheet winding device, a pneumatic motor to actuate same, a source of exhaust pressure to operate said motor, a tracker-bar having air-ducts therein controlling separate action pneumatics, and an independent pneumatic valve normally held open through exhaust pressure by the music sheet during its forward travel across the tracker-bar to close and stop the motor after the rewind, said valve being controlled through a predetermined air-duct and actuated when the music sheet uncovers a sufficient number of said air-ducts upon leaving the tracker-bar to equalize the exhaust pressure through said action pneumatics.

4. In a mechanical musical instrument controlled by a perforated music-sheet and tracker-bar, a music-sheet winding device, a pneumatic motor to actuate same, a source of exhaust pressure to operate said motor, a tracker-bar having air-ducts therein controlling separate action pneumatics, and a valve normally held open through exhaust pressure while the music-sheet is moving in either direction when covering the air-ducts in said tracker-bar, but closed to stop the motor when a sufficient number of said air-ducts remain exposed by the music-sheet leaving the tracker-bar to equalize the exhaust pressure through said action pneumatics.

5. In a mechanical musical instrument controlled by a perforated music-sheet and tracker-bar, a music-sheet winding device, a pneumatic motor to actuate same, a source of exhaust pressure to operate said motor, a tracker-bar having air-ducts therein controlling separate action pneumatics, and an independent pneumatic valve normally held open through exhaust pressure while the music-sheet is moving in either direction when covering the air-ducts in said tracker-bar, but closed to stop the motor when a sufficient number of said air-ducts remain exposed by the music-sheet leaving the tracker-bar to equalize the exhaust pressure through said action pneumatics.

6. In a mechanical musical instrument controlled by a perforated music-sheet and tracker-bar, a music-sheet winding device,

a pneumatic motor to actuate same, a source of exhaust pressure to operate said motor, a tracker-bar having air-ducts therein controlling corresponding action pneumatics, and means, comprising a pneumatically operated valve intermediately connected with one of said air-ducts and its action pneumatic and controlled thereby, normally held open by said exhaust pressure while the music-sheet is moving in either direction when covering the air-ducts in said tracker-bar, but closed to stop the motor when a sufficient number of said air-ducts remain exposed by the music-sheet leaving the tracker-bar to equalize the exhaust pressure through said action pneumatics.

7. In a mechanical musical instrument controlled by a perforated music-sheet and tracker-bar, a music-sheet winding device, a pneumatic motor to actuate same in either direction, a source of exhaust pressure to operate said motor, a tracker-bar having air-ducts therein, a travelling music-sheet registering with said ducts, a note-playing action comprising a series of action pneumatics controlled from said air-ducts, and a valve normally held open by said exhaust pressure while the music-sheet is moving in either direction when covering said air-ducts, but brought into operation to stop the motor whenever a sufficient number of air-ducts are uncovered on the rewind to equalize said exhaust pressure to atmospheric pressure through said player action.

8. In a mechanical musical instrument controlled by a perforated music-sheet and tracker-bar, a music-sheet winding device, a pneumatic motor to actuate same in either direction, a source of exhaust pressure to operate said motor, a tracker-bar having air-ducts therein, a travelling music-sheet registering with said ducts, a note-playing action comprising a series of action pneumatics controlled from said air-ducts, and an independent pneumatic valve normally held open by said exhaust pressure while the music-sheet is moving in either direction when covering said air-ducts, but brought into operation to stop the motor whenever a sufficient number of air-ducts are uncovered on the rewind to equalize said exhaust pressure for operating said valve to atmospheric pressure through player action.

9. In a mechanical musical instrument controlled by a perforated music-sheet and tracker-bar, a music-sheet winding device, a pneumatic motor to actuate same in either direction, a source of exhaust pressure to operate said motor, a tracker-bar having air-ducts therein, a travelling music-sheet registering with said ducts, a note-playing action comprising a series of action pneumatics controlled from said air-ducts, and means, comprising a pneumatically operated

valve mechanism connected with one of said air-ducts and its action pneumatic, normally held open by said exhaust pressure while the music-sheet is moving in either direction  
 5 when covering said air-ducts, but brought into operation to stop the motor whenever a sufficient number of air-ducts are uncovered on the rewind to equalize the exhaust pressure for operating said valve mechanism  
 10 to atmospheric pressure through said player action.

10. In a musical instrument controlled by a perforated music-sheet and air-ducts cut in a tracker-bar connected with separate action pneumatics, a wind-chest under exhaust pressure, a control pneumatic under spring tension connected with the wind-chest and collapsed thereby, and a normally open valve interposed between a predetermined tracker-duct and its action pneumatic, but  
 20 closed when said exhaust pressure is cut off from the control pneumatic and said tracker-duct is uncovered by the sheet.

11. In a musical instrument controlled by a perforated music-sheet and air-ducts cut in a tracker-bar connected with separate action pneumatics, a wind-chest under exhaust pressure, a valve mechanism controlling the movement of the music-sheet, a  
 30 control pneumatic under spring tension connected with the wind-chest and collapsed thereby, and a second valve between a predetermined tracker-duct and said valve mechanism normally closed by said control pneumatic when collapsed, but opened by  
 35 the lifting of said control pneumatic when said exhaust pressure is cut off from said valve mechanism and said tracker-duct is uncovered by the sheet.

12. In a pneumatic playing attachment for musical instruments, the combination with a wind-chest under exhaust pressure, of a control pneumatic under spring tension connected with the wind-chest and collapsed  
 45 thereby, and a valve normally closed by said pneumatic when connected with the wind-chest and interposed between an open port and an exhaust port, said valve being opened by the spring in said pneumatic  
 50 when the exhaust pressure in said pneumatic is cut off from said wind-chest.

13. In a pneumatic playing attachment for musical instruments, the combination with a wind-chest under exhaust pressure,  
 55 of a control pneumatic normally under spring tension connected with the wind-chest and collapsed thereby, and a valve normally closed by said pneumatic when collapsed and interposed between an open  
 60 port and an exhaust port, said valve being opened by said pneumatic when expanded by said spring after the exhaust pressure in said pneumatic is cut off from said wind-chest.

65 14. The combination with a perforated

music-sheet, of a tracker-bar having air-ducts and a pneumatic control device comprising a spring-tensioned pneumatic normally expanded, a wind-chest under exhaust pressure connected to said pneumatic to hold  
 70 same collapsed, a valve interposed between one of said air-ducts and pneumatic normally closed thereby when collapsed and said air duct is closed by the music-sheet, but opened by said spring when a sufficient number  
 75 of air-ducts are exposed by the absence of the music-sheet on said tracker-bar to equalize the exhaust pressure in said pneumatic through said wind-chest.

15. In a musical instrument controlled by a travelling perforated music-sheet registering with air-ducts in a tracker-bar, separate action pneumatics connected with the air-ducts, a wind-chest under exhaust pressure,  
 80 a valve mechanism connected with the wind-chest controlling the travel of the music-sheet, a control pneumatic under spring tension connected with the wind-chest and collapsed by the exhaust pressure therein, and a normally open valve between a tracker-duct and its action pneumatic, but closed  
 85 when the exhaust pressure is cut off from the control pneumatic after a sufficient number of said tracker-ducts are uncovered on the rewind to equalize the exhaust pressure in said valve mechanism to atmospheric pressure through said action pneumatics.

16. In a musical instrument controlled by a perforated music-sheet and air-ducts in a tracker-bar connected with separate action pneumatics, a wind-chest under exhaust pressure, a control pneumatic under spring tension held in inoperative position by said exhaust pressure during the sheet's forward travel, but brought into operation after the  
 100 sheet's reverse travel when said exhaust pressure is cut off from the control pneumatic after the wind-chest and the action pneumatics are equalized to atmospheric pressure through uncovered air-ducts.

17. In a musical instrument controlled by a perforated music-sheet and air-ducts in a tracker-bar connected with separate action pneumatics, a wind-chest under exhaust pressure, a control pneumatic under spring tension held in inoperative position by said exhaust pressure during the sheet's forward travel with the action pneumatics connected with their respective air-ducts, but brought into operation after the sheet's reverse travel  
 115 when said exhaust pressure is cut off from the control pneumatic after the wind-chest and the action pneumatics are equalized to atmospheric pressure through uncovered air-ducts.

18. In a musical instrument controlled by a perforated music-sheet and air-ducts in a tracker-bar connected with separate action pneumatics, a wind-chest under exhaust pressure, a control pneumatic under spring  
 120 pressure, a control pneumatic under spring

tension closed by said exhaust pressure during the sheet's forward travel, but opened by said spring after the sheet's reverse travel when said exhaust pressure is cut off from the control pneumatic after the wind-chest and the action pneumatics are equalized to atmospheric pressure through uncovered air-ducts.

19. In a musical instrument controlled by a perforated music-sheet and air-ducts in a tracker-bar connected with separate action pneumatics, a wind-chest under exhaust pressure, a control pneumatic under spring tension closed by said exhaust pressure during the sheet's forward travel with the action pneumatics connected with their respective air-ducts, but opened by said spring after the sheet's reverse travel when said exhaust pressure is cut off from the control pneumatic after the wind-chest and the action pneumatics are equalized to atmospheric pressure through uncovered air-ducts.

20. In a mechanical musical instrument

controlled by a perforated music-sheet and tracker bar; a music-sheet winding device, a pneumatic motor to actuate same, a source of exhaust pressure to operate said motor, a tracker-bar having air-ducts connected with separate action pneumatics, a wind-chest connected with said exhaust pressure, a control pneumatic under spring tension having air connections between one of said air-ducts, its corresponding action pneumatic, and to an exhaust control device, said control pneumatic being held collapsed against spring tension during the music-sheet's forward travel by exhaust pressure from the wind-chest thereby providing a direct connection between said air-duct and its action pneumatic, but opened by said spring when a free connection is made between the air-ducts and the exhaust control device after the completion of the reverse travel of the music-sheet.

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