R. J. BENNETT.

AUTOMATIC PLAYING ATTACHMENT FOR MUSICAL INSTRUMENTS.

APPLICATION FILED MAY 9, 1910.

1,040,261.

Patented Oct. 8, 1912.

2 SHEETS—SHEET 1.

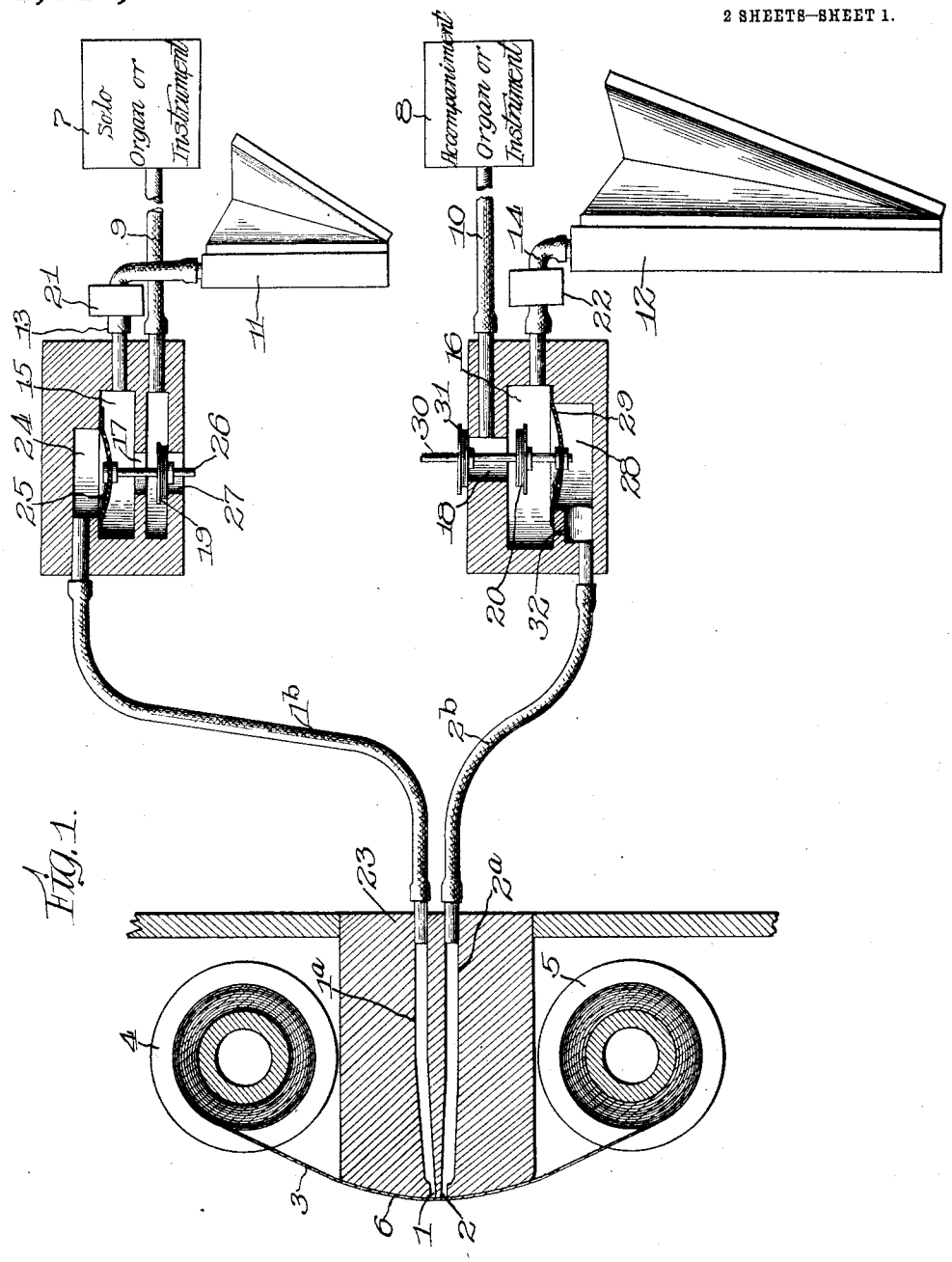

Fig. 1.

Witnesses:
G. W. Domarus Jr.
J. F. Gochuis Jr.

Inventor:
Robert J. Bennett
By: Brown Hopkins
Attys:

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

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2 SHEETS—SHEET 2.

Fig. 2.

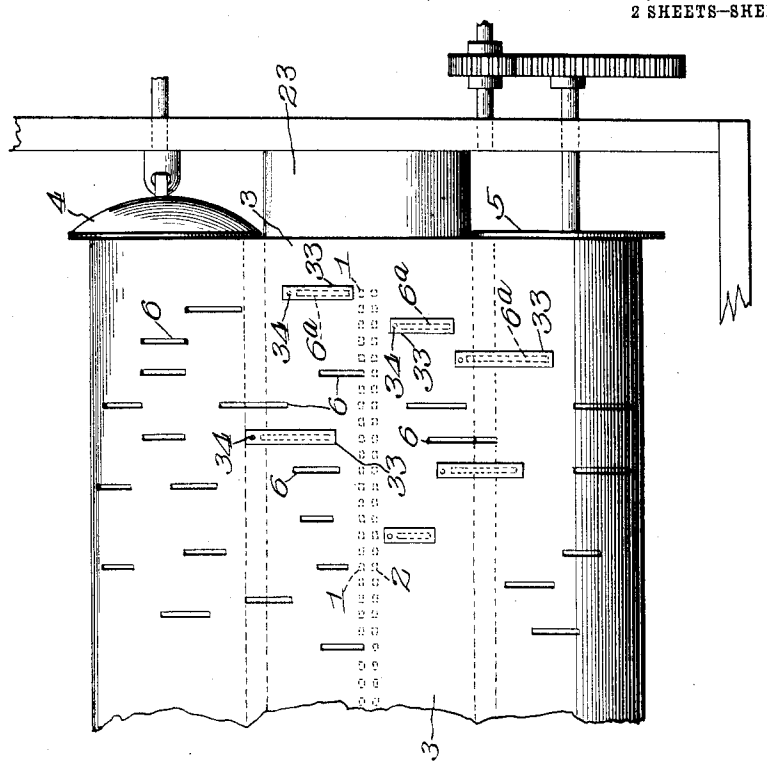


Fig. 4.

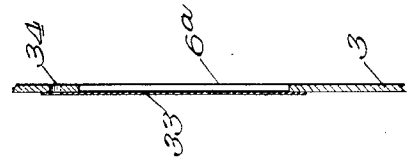
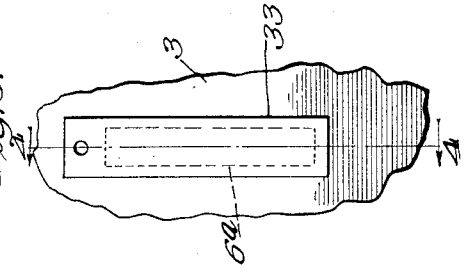


Fig. 3.



Witnesses:
G. C. Dorsey Jr.
J. F. Jochum Jr.

Inventor:
Robert J. Bennett
By: Brown Hopkins
Attys.

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

ROBERT J. BENNETT, OF MOLINE, ILLINOIS.

AUTOMATIC PLAYING ATTACHMENT FOR MUSICAL INSTRUMENTS.

1,040,261. Specification of Letters Patent. Patented Oct. 8, 1912.

Application filed May 9, 1910. Serial No. 560,261.

To all whom it may concern:

Be it known that I, ROBERT J. BENNETT, a citizen of the United States, residing at Moline, in the county of Rock Island and State of Illinois, have invented certain new and useful Improvements in Automatic Playing Attachments for Musical Instruments, of which the following is a full, clear, and exact specification.

This invention relates to pneumatic automatic playing attachments for musical instruments, and more particularly to those employing a record sheet serving to control air passages usually called "tracker ducts" which are connected with pneumatics for controlling the instrumentalities whereby the notes are sounded. Some musical instruments of this nature are designed to play a solo instrument and an accompaniment instrument by one and the same record sheet. This is particularly true in wind instruments, such as pipe organs comprising an accompaniment organ and a solo organ, where it is desired to accentuate certain parts of the solo on the solo instrument without correspondingly sounding the same notes on the accompaniment instrument, but this characteristic is, of course, not confined to wind instruments or organs. It is quite apparent that by the employment of usual expedients the notes would be sounded on both instruments without discrimination, where the operation of the instrument depends upon the admission of air to the tracker ducts by the passage of a perforated record over the same, if the tracker ducts for both instruments be arranged in line so as to be uncovered by the same note opening in the record sheet. If not so arranged, the combined length of the two series of tracker duct openings will be objectionably increased by the staggered relation of the openings thus required, and moreover, the record sheet will be correspondingly increased in width by the necessitated additional note openings.

The invention, therefore, has for its primary object to provide an improved pneumatic playing attachment for musical instruments of such construction that the openings of two series of tracker ducts may be arranged in line with the same note opening in the record sheet in a way to effect the operation of the note sounding instrumentalities controlled by one of the tracker ducts in such line without similarly sounding the note controlled by another tracker duct in the same line.

With a view to the attainment of these ends and the accomplishment of certain other objects which will hereinafter appear, the invention consists in the features of novelty which are shown in the accompanying drawings and which will now be more fully described and also particularly pointed out in the claims.

In the said drawings—Figure 1 is a diagrammatic view of a pneumatic playing attachment for musical instruments embodying this invention, showing the tracker board and record spools in transverse section. Fig. 2 is a front elevation of the record sheet and spools with related parts. Fig. 3 is an enlarged face view of the record sheet adjacent one of the recesses therein; and Fig. 4 is a section thereof on the line 4—4 of Fig. 3.

1 and 2 are the two series of tracker duct openings which, as shown in Fig 2, are arranged in lines extending transversely of the record sheet, which is shown at 3, and they are also arranged in lines parallel with the line of movement of the sheet in which it travels when being unwound from the spool 4 on to the other spool 5 by the usual or any suitable means, that is to say, each opening 1 of the upper series is directly above or in line with one of the openings 2 in the lower series, so that a note opening or perforation, such as 6 in the record sheet, will register with both of these tracker duct openings, first with the upper one and then with the lower one, and if the note opening be of sufficient length, it will for a time register with the two tracker duct openings simultaneously. These tracker openings 1 and 2 control respectively the instrumentalities whereby the notes of the musical instrument or instruments are sounded. The musical instruments are not illustrated in the drawings, but are indicated diagrammatically at 7, 8. These illustrations may be regarded as respectively comprising a solo organ or other instrument and an accompaniment

organ or other instrument, each including the necessary instrumentalities whereby the notes are sounded. Such instrumentalities usually comprise a valve apparatus commonly known in the art as a controlling pneumatic, any one of many examples of which might be employed, and which ordinarily comprise means whereby they become active for setting into operation the note sounding instrumentalities of the musical instrument when air is admitted to the controlling pneumatic for breaking or partially reducing a vacuum or partial vacuum existing therein. The pipes or passages for thus admitting air to the controlling pneumatics are shown in the accompanying drawings at 9 and 10 respectively. This partial vacuum in each of the controlling pneumatics of the instruments 7 and 8 is under the control of the record sheet 3, as usual, but according to this invention, while one of the musical instruments is actuated to sound its note by admission of air to its series of tracker duct openings, the admission of air to the other series of tracker duct openings which control the other musical instrument is ineffectual, and the latter said instrument can only be actuated by connecting the tracker duct openings together at a time when the admission of external air is shut off from both. Therefore, according to this invention, the solo instrument, for example, is actuated by an increase in the degree of vacuum existing in its tracker duct opening or openings, brought about by connecting the tracker duct openings together at a time when the valves they control are subjected respectively to high and low tension exhausters; while the accompaniment instrument operates as heretofore by the admission of air to its tracker duct for reducing the degree of vacuum therein. Any suitable mechanism may be employed for producing these functions according to this principle. In the exemplification shown in the drawings, air is exhausted from the two pipes or passages 9, 10 respectively by low and high tension exhausters or bellows 11, 12 connected by pipes 13, 14 with chambers 15, 16 respectively, which communicate respectively with pipes 9, 10 through ports 17, 18 controlled by valves 19, 20. In constructing the invention for commercial purposes, there would, of course, be employed as many pipes or passages 10 as there are note sounding instrumentalities to be actuated, or as many controlling pneumatics as there are in each of the instruments 7, 8. In an organ or piano of the usual form, it is customary to employ one of these controlling pneumatics for each key. Consequently, in practice, there should be employed as many of the valves 19, 20 as there are tubes or passages 9, 10, with a corresponding number of chambers 15, 16 individual to these valves, and as all of these chambers belonging to the solo organ, for example, should be subjected to substantially the same air tension, and those belonging to the accompaniment organ subjected to substantially the same tension, but of a higher degree, or different tension from that existing in the chambers 15, it is desirable to connect the exhausters 11, 12 respectively with wind chest or trunks 21, 22, so that but one exhauster will be required for each series of chambers 15, 16.

The valves 19, 20 are controlled by variation in air tension in the tracker ducts leading from the tracker duct openings 1, 2. In this illustration of the invention, these tracker ducts are shown at 1^a, 2^a respectively, as being formed in a tracker board 23, there being as many of the ducts 1^a, 2^a as there are openings 1, 2 in the face of the tracker board over which the record sheet 3 travels, as usual. For convenience of construction, these tracker ducts 1^a, 2^a may be extended by tubes 1^b, 2^b respectively, so as to facilitate their connection with the devices for controlling the valves 19, 20. The tube 1^b from each of the tracker ducts 1^a extends to a chamber 24, one side of which is closed by a flexible diaphragm or other movable pressure abutment 25 connected by stem 26 to valve 19, whose area is less than that of the diaphragm 25, and consequently is held over so as to close a port 27 leading to the atmosphere by the vacuum or partial vacuum existing in chamber 15. The tube 2^b leading from each of the ducts 2^a communicates with a chamber 28, which is closed on one side by a diaphragm or pressure abutment 29 or other movable abutment, and which is connected by stem 30 with valve 20, and also with a second valve 31 arranged to cut off the admission of external air through port 18 when the valve 20 is open, and to admit external air to the port 18 and consequently to the pipe 10 when the valve 20 is closed, both of these valves 20 and 31 being of smaller area than the diaphragm 29, so that when the air tension in chambers 16, 28 fluctuates, the valves 20 and 31 will be correspondingly opened and closed. The chamber 28 is connected by a small passage or bleed hole 32 with the chamber 16, so that the exhauster 12 will bleed chamber 28 and the tracker duct connected therewith of the air therein, and equalize the air tension on both sides of the diaphragm 29 when the admission of external air to tracker duct 2^a is cut off, thereby permitting the external air pressure to force valve 31 to its seat, but as soon as external air is admitted to tracker duct 2^a through one of the note openings 6 in the record sheet, this equilibrium will be distributed and the air pressure thus admitted will force diaphragm 29 toward

valve 20 and cause it to close, while opening port 18 to the external air and thereby breaking the vacuum or partial vacuum existing in passage 10, thus resulting in the actuation of the accompaniment instrument 8 as usual, and when duct 2^a is again closed by the record sheet, the parts will be restored to the position shown in Fig. 1, as will be readily understood.

It is of course apparent that the note opening 6 while admitting external air to tracker duct 2^a, also admits air to the tracker duct 1^a of the solo instrument, but the latter is not thereby actuated, because this admission of air only tends to increase the pressure against diaphragm 25 and hold valve 19 tighter to its seat over port 27, thus preventing the vacuum or partial vacuum being broken in pipe 9. In order, however, that the record sheet may serve to break or relieve the vacuum in pipe 9, means are provided whereby the air may be exhausted from chamber 24 to a degree causing the diaphragm 25 to lift valve 19 from its seat around port 27 and force it to its seat around port 17. The means for accomplishing this must, of course, be capable of creating a higher tension in the chamber 24 than can be created by the exhauster 11 and it is seen that by connecting the duct 1^a to the duct 2^a, this result is instantly accomplished. In order that they may be thus connected, the record sheet is provided with a recess 6^a in its inner face, so formed and situated as to bridge the tracker board openings 1, 2. Any suitable expedient may be resorted to for thus creating the recess in the record sheet, such for example, as by first providing the sheet with the open perforation like perforation 6, and then pasting a thin sheet 33 thereover so as to close it from the outer side, the face of the tracker board serving to close the recess at the inner side at all points excepting where the tracker board openings 1, 2 exist. Thus connecting the duct 1^a with the duct 2^a, however, does not necessarily result in correspondingly actuating the accompaniment instrument, for the reason that the bleed opening 32 may be so small as compared with the outlet from chamber 16 to the exhauster 12 that the slight amount of air drawn from duct 1^a will be insufficient and the opening 32 will bleed chamber 28 too slowly, as compared with the rapid exhaust from chamber 16 to effect the actuation of the valve 31. In order that the valve 19 may be restored to the position shown in Fig. 1 by the admission of air to chamber 24, as soon as the recess 6^a has passed the opening of the tracker board 1^a, the record sheet is provided at the end of the recess 6^a with a small supply port 34, which, however, is not of sufficient size, or need not be of sufficient size to admit air so freely to the duct 2^a when it passes the opening of the latter as to disturb the equilibrium of air tension existing on opposite sides of the diaphragm 29. As soon as port 34 registers with opening 1, normal, or substantially normal atmospheric pressure is restored in chamber 24, and valve 19 again closes port 27.

With the invention thus described, it will be understood that any ordinary perforated record sheet adapted to be used with a tracker board having but a single series of tracker duct openings, may be modified by the addition of the closing caps or sheets 33 wherever desired to produce the effect sought to be obtained; and it will also be seen that with the described arrangement of tracker duct openings in combination with means for connecting them together when it is desired to accentuate or actuate one of the instruments without correspondingly operating the other one, the tracker duct openings in each series may be placed as close together as would be safe to avoid a note opening in the record intended to register with one tracker duct overlapping the adjacent tracker duct in the same series, and as a consequence, the desired result is accomplished with a tracker board of reduced length and a record sheet of reduced width.

What I claim is:

1. In an apparatus of the class described, the combination of a traveling record sheet, a plurality of tracker ducts arranged in a line parallel with the direction of travel of said sheet, note sounding instrumentalities, means connecting said ducts respectively with said note sounding instrumentalities for actuating said instrumentalities respectively when air is admitted to one of said ducts and exhausted from the other, said record sheet having perforations for admitting air to one of said ducts, means for exhausting the air from the latter, and means associated with the record sheet for connecting said ducts together to form a continuous passage.

2. In an apparatus of the class described, the combination of a traveling record sheet, a plurality of tracker ducts arranged in a line parallel with the direction of travel of said sheet, note sounding instrumentalities, means for connecting said ducts respectively with said note sounding instrumentalities for actuating said instrumentalities respectively when air is admitted to one of said ducts and exhausted from the other, said sheet having perforations for admitting air to one of said ducts, means for exhausting the air from the latter, means for connecting said ducts together whereby one will be exhausted into the other, and means for increasing atmospheric pressure in one of said ducts after it is thus exhausted into the other.

3. In an apparatus of the class described,

the combination of two tracker ducts, a record sheet having means for pneumatically connecting said ducts together to form a continuous duct and note openings for admitting air to said ducts, note sounding instrumentalities connected with and controlled by said ducts respectively, and means for exhausting the air from one of said ducts.

4. In an apparatus of the class described, the combination of two tracker ducts, a record sheet having a recess for pneumatically connecting said ducts together to form a continuous passage and a note opening arranged to register with said ducts, note sounding instrumentalities connected with and controlled by said ducts respectively, and means for exhausting the air from said ducts.

5. In an apparatus of the class described, the combination of two tracker ducts, a record sheet having a recess for pneumatically connecting said ducts together to form a continuous passage and a note opening arranged to register with said ducts, said record sheet also having an air supply port arranged at the after end of said recess in line with said ducts for admitting air thereto, note sounding instrumentalities connected with and controlled by said ducts, and means for exhausting the air from said ducts.

6. In an apparatus of the class described, the combination of separate tracker ducts, separate instrumentalities adapted to be actuated by the admission of air thereto, valves for controlling the admission of air to said instrumentalities, means for subjecting said valves to different degrees of pressure for holding them closed, including means for exhausting the air from one of said tracker ducts, means whereby the admission of air to the latter said duct opens one of said valves, means whereby the other one of said valves is opened when a degree of vacuum is created in the other of said ducts, a record sheet having a note opening arranged in the line of said ducts and adapted to register therewith, and means associated with said sheet for pneumatically connecting said ducts together.

7. In an apparatus of the class described, the combination of separate tracker ducts, separate instrumentalities to be actuated by the admission of air thereto, valves for controlling such admission of air to said instrumentalities respectively, fluid pressure abutments for controlling said valves respectively, air exhausting means for subjecting said abutments to different degrees of air tension, means whereby said air tension is reduced on one of said abutments when air is admitted to one of said tracker ducts, means whereby said air tension is counteracted on the other of said abutments when air is exhausted from the other of said tracker ducts, and means for connecting the latter tracker duct with said air exhausting means.

8. In an apparatus of the class described, the combination of separate tracker ducts terminating in tracker duct openings, a traveling record sheet having note openings, said tracker ducts having their openings arranged in a line parallel with the line of travel of said note openings and adapted to register with the latter, means associated with said sheet for connecting said tracker duct openings together to form a continuous passage, and note sounding instrumentalities connected respectively with said tracker ducts and controlled thereby.

9. In an apparatus of the class described, the combination of a record sheet provided with a recess in one face thereof closed at its outer side, a plurality of tracker ducts having openings arranged in the line of travel of said recess and adapted to be pneumatically connected together thereby to form a continuous passage and note sounding instrumentalities connected with and controlled by said tracker ducts respectively.

10. In an apparatus of the class described, the combination of a record sheet having one or more recesses in one face thereof closed on the other face of the sheet against the admission of air, and one or more note openings arranged in the same line of travel of said recesses, a plurality of tracker ducts having openings arranged in said line of travel and adapted to register with said recesses, and note openings, and note sounding instrumentalities operatively connected with and controlled by said tracker ducts respectively.

11. In an apparatus of the class described, the combination of two tracker ducts, a record sheet having means for pneumatically connecting said ducts together to form a continuous passage and provided with note openings arranged in line with said ducts and adapted to register therewith, two chambers having a restricted communicating passage, one of which is connected with one of said tracker ducts, a high tension exhauster connected with the other of said chambers, a diaphragm separating said chambers, an air port for admitting air to one of said chambers, pneumatically controlled note sounding instrumentalities pneumatically connected with the last said chamber, two valves for respectively controlling the admission of air to the latter said chamber and communication between that chamber and said note sounding instrumentalities, a third chamber with which the other one of said tracker ducts communicates, a fourth chamber, a low tension exhauster connected with said fourth chamber, a diaphragm separating said third and fourth chambers, a second set of pneumatically controlled note sounding instrumen-

talities, and a valve connected with the second said diaphragm for alternately placing the said second set of note sounding instrumentalities in communication with the said fourth chamber and the atmosphere as said second diaphragm vibrates.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, on this 6th day of May, A. D. 1910.

ROBERT J. BENNETT.

Witnesses:
J. H. JOCHUM, Jr.,
C. H. SEEM.