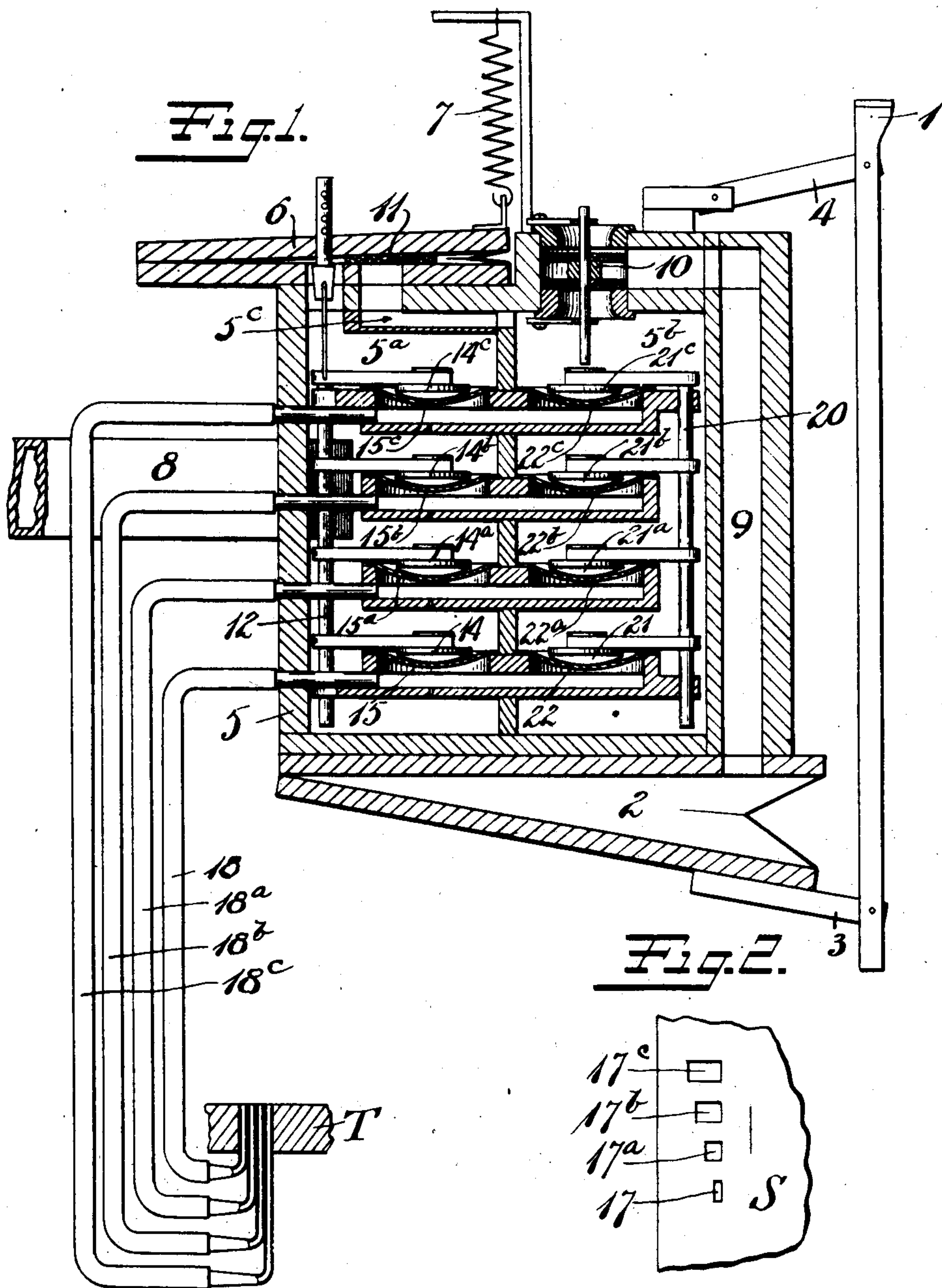


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AUTOPNEUMATIC MUSIC PLAYING INSTRUMENT.

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# UNITED STATES PATENT OFFICE.

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## AUTOPNEUMATIC MUSIC-PLAYING INSTRUMENT.

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To all whom it may concern:

Be it known that I, WALTER R. CRIPPEN, a citizen of the United States, residing at Cambridge, county of Middlesex, Massachusetts, have invented certain new and useful Improvements in Autopneumatic Music-Playing Instruments, of which the following is a full, clear, and exact description.

This invention relates to improvements in autopneumatic music playing instruments. In such instruments it is desirable, in order to secure artistic effects, to provide means whereby in such pieces as demand a solo, said solo effect shall be produced. This involves frequently the striking of the solo notes simultaneously with the accompaniment or substantially so. At other times the solo notes are struck alone. By my improved invention it is immaterial in what part of the composition the solo note occurs, the same may be caused to stand out clearly and conspicuously.

My invention also contemplates means whereby the degree of force applied to the solo note may be modified and varied relatively to the accompaniment.

In the drawings, Figure 1 is a section, partly in elevation, of a single key action complete. Fig. 2 illustrates a fragment of a perforated note sheet.

1 represents a striking arm for a sounding device or key.

2 is what is commonly termed the action pneumatic by the operation of which the note striking arm is moved. In the particular form shown, the action pneumatic 2 is connected to the striking arm 1 through the medium of a lever 3, the upper portion of said arm being held by a link 4.

5 is a controller chest having two separate compartments 5<sup>a</sup> 5<sup>b</sup>.

6 is a tension regulating bellows normally distended in any suitable way, for example, by means of a spring 7.

8 is the exhaust, the passage through which communicates with the compartment 5<sup>a</sup> of the controller chest 5 and through it with the interior of the regulating bellows 6.

9 is a passage leading from the interior of the action pneumatic 2 to a valve 10. This valve 10 is located in a passage normally open to the atmosphere and closed to compartment 5<sup>b</sup>. When this valve is open to atmosphere the power pneumatic will be distended. When, however, this valve is closed to the atmosphere, the passage 9 will be open to the compartment 5<sup>b</sup> and the action pneumatic will be collapsed and the note will be sounded with that degree of force proportional to the degree of vacuum in compartment 5<sup>b</sup>. This degree of tension or vacuum is regulated by means of the bellows 6, which is in direct communication through passage 5<sup>a</sup> with compartment 5<sup>b</sup>. It is there-

fore necessary to provide means whereby this regulating bellows may be so controlled in its action that the desired degree of tension will occur in compartment 5<sup>b</sup> of action pneumatic 2. This is controlled by throttling the passage of air through the regulator 6.

11 is a throttle valve operated by bellows 6 and controlling the passage 5<sup>c</sup>. In the particular form shown, when the regulating bellows 6 is collapsed so that valve 11 will close the passage 5<sup>c</sup>, I provide means for variably distending to the desired degree the regulating bellows, so that it will open the throttle valve 11 to the desired extent. This mechanism in its preferred form is illustrated in the drawings and comprises a push rod 12 suitably connected with the bellows 6, so that when said rod is lifted the bellows will be distended and the throttle will be opened so as to put compartments 5<sup>a</sup> and 5<sup>b</sup> in communication. To operate rod 12 I provide one or more controlled devices 14 14<sup>a</sup> 14<sup>b</sup> 14<sup>c</sup>, which in the particular form shown are offset from rod 12. These controlled devices are in the form of buttons overstanding what are in effect bellows 15 15<sup>a</sup> 15<sup>b</sup> 15<sup>c</sup> respectively. Each of these bellows is independent and each is in suitable communication with the tracker board T so as to be controlled by the perforated note sheet S.

In Fig. 1, I have illustrated a preferred form of tracker board T in which the board has a single note opening said opening having three partitions therein. The several partitioned spaces are in communication respectively with the bellows 15 15<sup>a</sup> 15<sup>b</sup> 15<sup>c</sup> through ducts 18 18<sup>a</sup> 18<sup>b</sup> 18<sup>c</sup>. In note sheet S are shown several perforations, 17 17<sup>a</sup> 17<sup>b</sup> 17<sup>c</sup>. Each of these perforations is adapted to a single tracker opening, but, according to its width it determines how many of the partitioned spaces will be open to atmosphere.

When the narrowest note perforation 17 encounters the partitioned duct, it will admit air to the bellows 15 and lift the controlled device 14<sup>c</sup>, which will move in a direction to open the throttle valve 11 slightly. At the same time the valve 10 will be operated by means of a push rod 20 having the offsets 21 21<sup>a</sup> 21<sup>b</sup> 21<sup>c</sup>, which are operated by bellows 22 22<sup>a</sup> 22<sup>b</sup> 22<sup>c</sup> similar to and connected respectively with the space underneath bellows 15 15<sup>a</sup> 15<sup>b</sup> 15<sup>c</sup> by passages. These passages are each provided with suitable small vents or so-called "bleed holes", to provide uniform tension on both sides of the collapsible portion of all the small bellows under normal conditions. It follows from the above that the moment air is admitted, for example to bellows 15 through the tracker board, it will also be admitted to the bellows 22, so that both push rods 12 and 20 will lift. The former will control the degree of opening of throttle 11, while the latter will close the valve 10 to the atmosphere and open it to the vacuum in compartment 5<sup>b</sup>, with the result that action pneumatic 2 will be collapsed and the



note will be sounded with a degree of force proportional to the degree of tension therein.

The perforation 17<sup>a</sup> is wide enough to include two partitioned spaces in tracker T, consequently two of the bellows, 15<sup>a</sup> 15<sup>b</sup>, will be operated, with the result that rod 12 will be operated with greater vigor and the throttle valve 11 will open still more, so that the action pneumatic would be operated with a correspondingly greater degree of force. Another perforation 17<sup>b</sup> in the note sheet may be of sufficient width to open three of the spaces in the tracker duct, with the result that the action pneumatic would be operated with a correspondingly increased force, and so on. 17<sup>c</sup> is a note sheet perforation of sufficient area to open all of the spaces in the single tracker duct shown.

While I have shown the bellows of the 15 series of the same area relatively, it is obvious that this is not essential, for they might be so proportioned and varied as to individually operate the regulator bellows with a different degree of force, so that by properly cutting the note sheet to select the proper partitioned space in the tracker duct any one of the bellows 15 might be selected as the one to operate the push rod 12. Of course whenever this push rod is operated, whether it be by one or more of the bellows of the series of 15, the valve 10 is also operated at the same time, as at that moment it is necessary to put the action pneumatic in communication with the vacuum. Instead of providing the vents or bleed holes, the usual well known primary pneumatics might be substituted between the tracker board and bellows 15.

I am aware that it is not broadly new to provide means for securing solo effects in mechanical music playing instruments, but heretofore in order to accomplish this result with a particular note or a series of notes that are to be struck at substantially the same time, it has been necessary to either advance or retard the said note in order to give a sufficient period to enable a difference in tension to be secured. In fact, such a mechanism is comprehended in my former patent No. 803,153. My present invention, however, is distinctively different in that the solo note and accompaniment notes may be struck at the same instant. So also by this improvement it is possible to strike the several notes of a chord at the same instant, each note being struck with a different degree of tension than that of any other note. Whereas in former devices supplemental marginal perforations in the tracker board have been required in order to automatically secure the desired change in tension, these are entirely unnecessary in the present instance.

From the foregoing it will be seen that only a single primary valve (such as valve 10) is required, and that only one wind-way or track may be required leading to the single equalizer or storage bellows (not shown). While the note sheet is cut with particular reference to determining the tension with which the action pneumatic is to operate, the particular invention claimed herein resides in the mechanism intermediate the note sheet and the action pneumatic.

In the drawings I have shown only one key action, but it should be understood that for each key action the mechanism illustrated in the accompanying drawing may be duplicated so far as it is intended to include any keys which are to be struck with varying degrees of

force. The consequence is it matters not how many of the keys are struck at once, each one of the same may be struck with a degree of force different from any other.

What I claim is:

1. In a device of the character described, a tracker-board having ducts therein, an individual key action-pneumatic, a controller-chest therefor, a vacuum chamber therein, an exhaust communicating with said vacuum chamber, a passage from said vacuum chamber to said action-pneumatic, an auto-pneumatically controlled tension governing throttle in said passage, means within the vacuum chamber for opening said throttle, including a plurality of note-sheet-controlled pneumatics, a normally closed valve independent of the throttle and in the passage between said throttle and said action-pneumatic, and means for moving said valve to open said passage simultaneously with the operation of opening the throttle. 70
2. In a device of the character described, a tracker-board having ducts therein, a key action-pneumatic, a controller-chest therefor having a vacuum chamber therein, an exhaust, a passage from the vacuum chamber in said chest to said action-pneumatic, an auto-pneumatically controlled tension governing throttle for said passage, means within the controller-chest for opening said throttle and including a series of independent note-sheet controlled pneumatics, an opening from the atmosphere to the passage leading to said action-pneumatic, a valve normally closing said passage and adapted to close said opening to the atmosphere, and means within the controller-chest to shift said valve to open said passage and close said opening to the atmosphere simultaneously with the opening of the throttle. 75
3. In a device of the character described, a tracker board having ducts therein, a key action pneumatic, a controller chest therefor having a vacuum chamber therein, means for creating a vacuum therein, a passage from the vacuum chamber in said chest to said action pneumatic, a throttle for said passage, means for moving said throttle, and means within the chest controllable from the tracker board for in turn controlling the operation of the throttle moving means, the interior of said action pneumatic being also in communication with the atmosphere, and a valve for opening said pneumatic to the atmosphere and closing it to the vacuum chamber and vice versa, and means for operating the same simultaneously with the operation of the throttle controller means. 80
4. In a device of the character described, a tracker board having ducts therein, a key action pneumatic, a controller chest therefor having a vacuum chamber therein, means for creating a vacuum therein, a passage from the vacuum chamber in said chest to said action pneumatic, a throttle for said passage, means for moving said throttle, and means within the chest controllable from the tracker board for in turn controlling the operation of the throttle moving means, the interior of said action pneumatic being also in communication with the atmosphere, and a valve for opening said pneumatic to the atmosphere and closing it to the vacuum chamber and vice versa, and means for operating the same simultaneously with the operation of the throttle controller means and operated from the same source. 85
5. In an apparatus of the character described, means for striking different note sounding devices with different degrees of force and comprising action pneumatics, an exhaust for said action pneumatics, a separate controller chest for each pneumatic between said exhaust and the corresponding pneumatic and having a passage leading to its respective action pneumatic, a throttle therefor, and means within said controller chest for actuating said throttle to control the degree to which the passage throttled thereby is opened. 90
6. In an apparatus of the character described, means for striking different note sounding devices with different degrees of force and comprising action pneumatics, an exhaust for said action pneumatics, a separate controller chest for each pneumatic between said exhaust and its corresponding pneumatic and having a passage leading to its respective action pneumatic, a throttle therefor, and means within said controller chest for actuating said 95



throttle to control the degree to which the passage throttled thereby is opened, a perforated tracker board in communication with each controller chest, and a note sheet having perforations therein of different areas for controlling the throttle controlling means within said chests.

7. In an apparatus of the character described, an individual key-action, comprising an action-pneumatic, an exhaust, a controller-chest between said exhaust and said action-pneumatic and in communication with both, a tension governing throttle in the passage leading from said controller-chest to said action-pneumatic, an independent valve in the passage between said throttle and said action-pneumatic, means for positively operating said valve to open wide the same, and means for variably operating the throttle to open the same to different degrees, both valve and throttle operating means being contained within the controller-chest.

8. In an apparatus of the character described, an individual key-action, comprising an action-pneumatic, an exhaust, a controller-chest between said exhaust and said action-pneumatic and in communication with both, a tension governing throttle in the passage leading to the action-pneumatic, and an independent valve in said passage between said throttle and said action-pneumatic, means for positively operating said valve to open wide the same, and means for variably operating the throttle to open the same to different degrees, said valve and throttle operating means being both contained within the controller-chest and including a plurality of inclosed pneumatics, a tracker-board, a plurality of ducts in the tracker-

board in communication with said pneumatics, a perforated note-sheet arranged to co-act with the perforations in said tracker-board to directly control the action of the pneumatics within the exhaust chamber, and indirectly control the degree to which the tension governing throttle is opened.

9. In an apparatus of the character described, an exhaust, a single key action including an action pneumatic, a partitioned and divided controller chest, a passage leading from one division in said chest to the other, a throttle therefor, a passage leading from the second division in said controller chest to said pneumatic, and a valve therein, and means within said controller chest for simultaneously opening the valve and for varying the degree of the opening of the throttle.

10. In an apparatus of the character described, an exhaust, a single key action including an action pneumatic, a partitioned and divided controller chest, a passage leading from one division in said chest to the other, a throttle therefor, a passage leading from the second division in said controller chest to said pneumatic, and a valve therein, and means within said controller chest for simultaneously opening the valve and for varying the degree of the opening of the throttle, a tracker board and a perforated note sheet arranged to traverse said tracker board for controlling the same.

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Witnesses:

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