

W. F. COOPER.
PNEUMATIC MOTOR.
APPLICATION FILED AUG. 12, 1912.

1,058,847.

Patented Apr. 15, 1913.

2 SHEETS-SHEET 1.

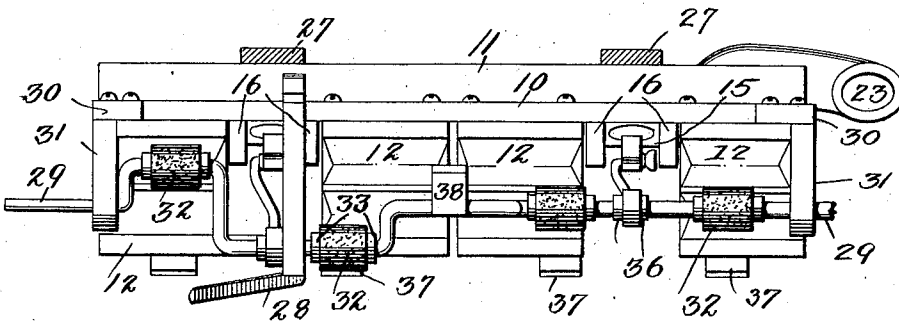
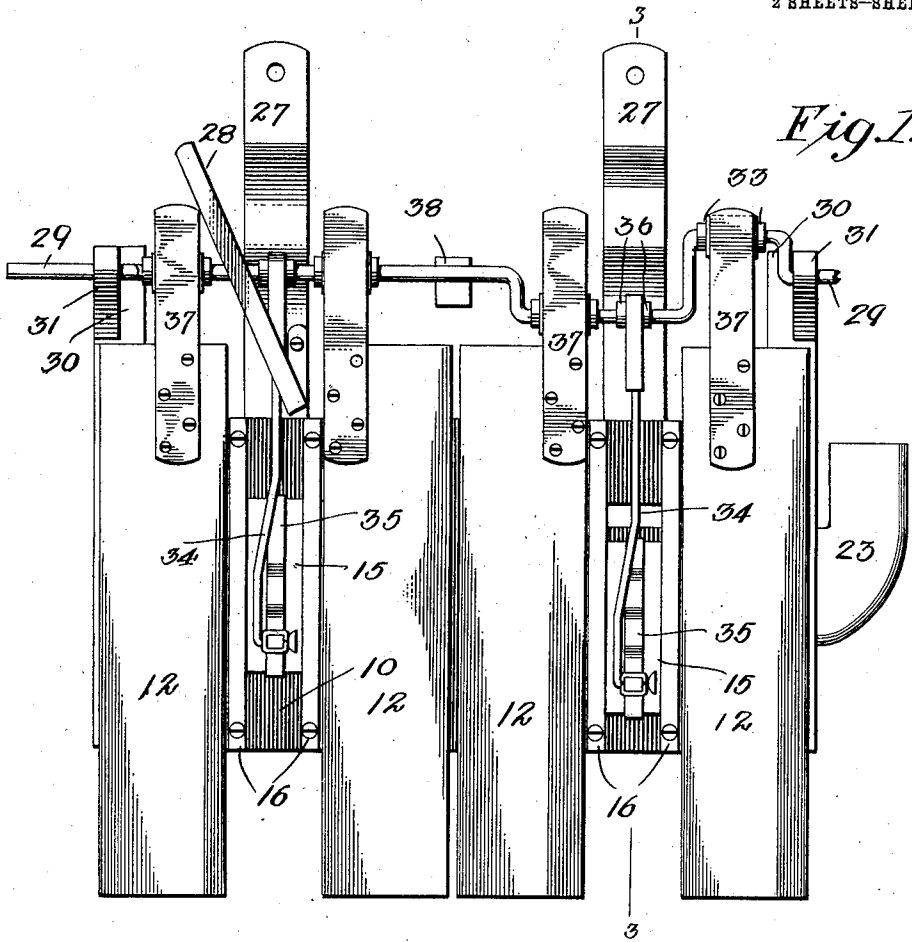


Fig. 2.

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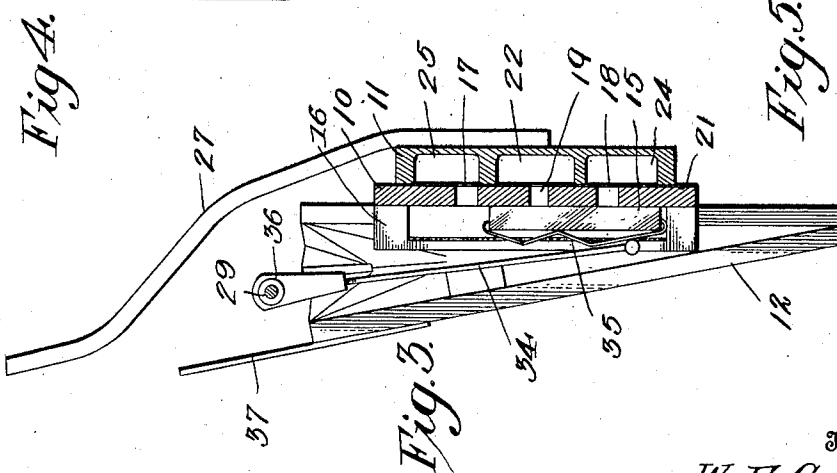
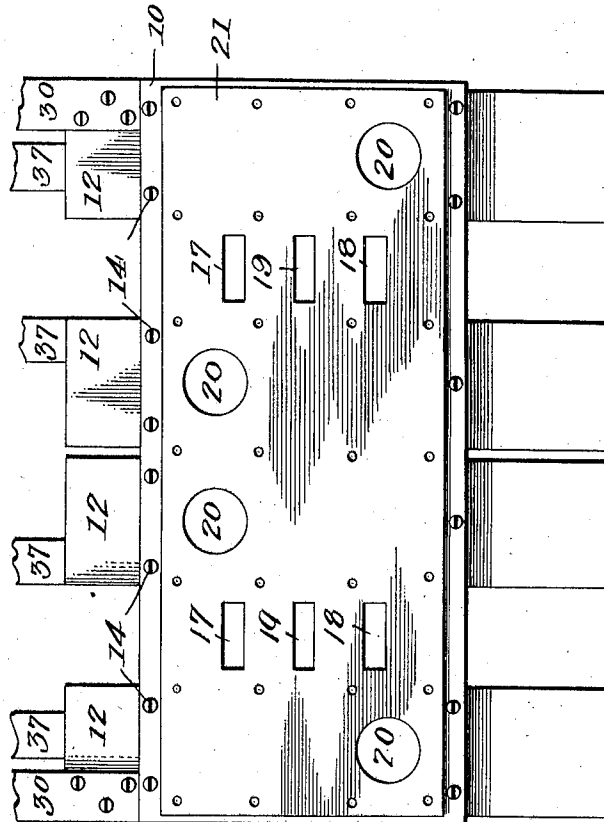
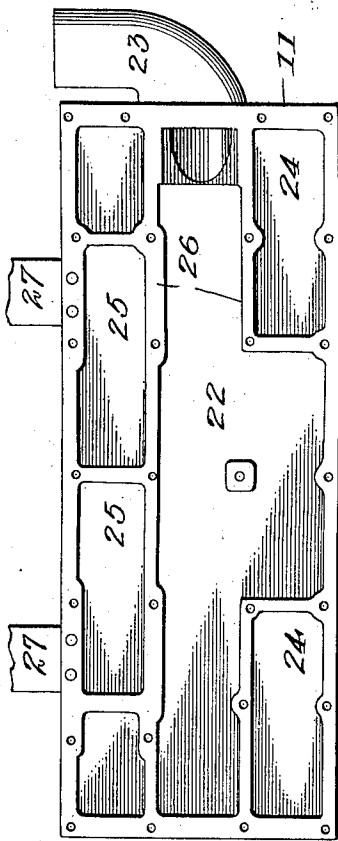
Attorneys

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UNITED STATES PATENT OFFICE.

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PNEUMATIC MOTOR.

1,058,847.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, WILLIAM F. COOPER, a citizen of the United States, and residing at Norwalk, in the county of Huron and State of Ohio, have invented certain new and useful Improvements in Pneumatic Motors, of which the following is a specification.

This invention relates to certain new and useful improvements in pneumatic motors and particularly that type which are employed in connection with pneumatically-operated self-playing pianos and like keyed instruments, the primary object of the present invention being to provide a motor of the requisite power of such construction that the same will be comparatively flat, or in other words, have a relatively narrow width so that the same will occupy a correspondingly narrow space within the instrument to which the player mechanism is applied.

A further object of the invention is to simplify the construction and increase the effectiveness of motors of this type by providing an improved arrangement of the pneumatics and valves, together with an improved construction of motor base readily separable so that access may be had to any of the parts desired for repairs or other purposes.

A still further object of the invention is to provide in a motor having a wood slide face for the valves to work upon, a non-warpage metal base to hold the wood slide face true, and prevent any twisting or other movement in such slide face as would interfere with the free and easy working of the slide valves.

A still further object is to provide an improved arrangement in motors of this type of the pneumatic arms connecting the crank shaft with the slide valves whereby the dimensions of the motor are maintained within a comparatively small compass.

With the above and other objects in view, the invention resides in the novel construction, combination and arrangement of parts as will be hereinafter more fully described and then claimed and in describing the invention in detail, reference will be had to the accompanying drawings forming a part of this specification and wherein like numerals of reference will be employed to designate like parts throughout the several views, in which:—

Figure 1 is a top plan view of a motor in

accordance with this invention. Fig. 2 is an end view of the same with the supporting straps thereof in section. Fig. 3 is a transverse vertical sectional view on line 3—3 of Fig. 1, the slide valve and supporting strap however being in side elevation. Fig. 4 is a view in plan of the removable section or back of the motor base, showing the inner face of such section, and channels provided therein, and, Fig. 5 is an underneath plan view of the motor with the section or back shown in Fig. 3 removed.

It is very desirable in installing player-mechanisms in pianos or other keyed-instruments that the mechanism be such that installation may be made without alteration of the case of the instrument. This is especially true of a player mechanism such as is shown, described and claimed in Letters Patent #833,026 granted to me, October 9, 1906, in which all the appliances and mechanisms entering into the player with the exception of the tracker box are arranged within the case of the instrument, behind the lower front board of such case. It is essential with player mechanisms of the type shown in the above referred to patent that the devices comprising the player be compact that they may be installed in the space provided, and to such type of player my improved motor is particularly adapted, though not confined to use with such type of player. Also, I do not confine myself to a motor of a "four-point" type which specific type has been arbitrarily chosen for illustrative purposes, since obviously a motor of the same principle but of a greater "point" type would be within the scope of my invention. The motor used with the player mechanism of the type referred to in above mentioned Patent #833,026, lies in a flat horizontal position under the key board of the instrument, and obviously it is desirable that the motor be as flat as possible and also of the least possible thickness. The principles of operation of motors of this type are well known to those skilled in the art. It is also well known that practically all motors of this type employ motor pneumatics and slide valves, many of the prior devices having the valves operating to shut off the air from each end, hence I do not claim such construction broadly, but will proceed to describe in detail my improvements in motors of this type.

To put my invention into practice, and

embodying that type of motor in which the slide valves operate to shut off the air from each end, I provide a base comprising two members, one of which I will herein term
 5 the face-member designated 10 which is made of wood, and the other of which members will be herein termed the lower back or base member designated 11 formed of non-warpable material and has channels cored
 10 out in the same. The face-member 10 carries the motor pneumatics 12 which are of the usual and well known construction, and which may be secured to the front or upper face of said face-member in any desired
 15 manner, for instance, as shown by screws 14 passed through the face-member, and into the backs of the motor pneumatics (Fig. 5). While the motor pneumatics are of the usual construction, their arrangement or mounting
 20 on the face-member is, so far as I am aware, new, and with a "four-point" type of motor as shown, these pneumatics are placed two close together at the center of the face-member and one at or near each end, this arrangement providing what I term two center
 25 pneumatics, and two outside pneumatics, slide valves 15 being mounted between the center and the outside pneumatics. Said valves are preferably formed of glass and
 30 operate upon the wood face-member 10 as disclosed in Letters Patent #1,028,863, slide valves for motors, granted to E. P. Chase and myself June 11, 1912, the slide valves and the motor pneumatics being mounted on
 35 the same side or face of the face-member 10. Said valves 15 reciprocate on the face of the face-member 10 in suitable guides 16 provided therefor. The face member 10 is provided for each slide valve with the upper
 40 inlet port 17 and the lower inlet ports 18. Also with the exhaust ports 19 located midway between each pair of ports 17-18, and constantly covered by the slide valves 15. Each bellows or pneumatic 12 exhausts
 45 through ports 20 in the face member, those for the center pneumatics being located near the upper edge of the board and the exhaust ports for the outside pneumatics being located near the lower edge of the board or
 50 face member 10 for a purpose as will more fully appear hereinafter.

The lower or base member 11 of the motor base or body, is, preferably formed of cast metal. It is firmly secured against the under
 55 face of the face-member in any suitable manner as by screws which enter openings provided therefor in both the said lower member and in the face-member 10. The lower member is made air-tight in any suitable
 60 manner preferably by the interposition of a sheet 21 of suitable material between the two members, such sheet being provided with ports 17 to 20 as in the face plate 10.

This lower member 11 is cored to provide
 65 the main exhaust channel 22 which at one

end communicates with the integral exhaust conduit 23 connected in any suitable manner (not shown) with the controller box (not shown) of a player mechanism. In the lower member 11, there are provided channels
 70 24, one for each port 18 and the ports 20 for each outside pneumatic, and channels 25 are also provided, one for each port 17 and the ports 20 for the center pneumatics. The coring of the back-member provides the
 75 walls 26 which separate the different channels in the said back-member through which walls the securing screws are inserted, the walls being flat-faced so as to effect a perfect air-tight fit with the face-member 10. The
 80 hangers or supporting straps 27 by means of which the motor is supported in position are preferably secured to the back member 11 as shown, and in practice, these brackets are attached to the top action rail (not shown) of
 85 the player action. One of said brackets in practice, carries an angle arm 28 constituting a support for the lead tubes (not shown) of the player action, so as to hold such tubes from the motor crank wire.

The pneumatics are operated by a specially constructed crank shaft or wire 29, suitably journaled beyond the expansion end of the pneumatics, as by providing arms 30 at the
 95 corners of the motor base, said arms having projecting journal lugs 31 in which the crank shaft or wire is received. This crank shaft or wire is provided with a crank for each pneumatic employed in the motor, the cranks being so disposed that at least one pneumatic is expanding when one or more than
 100 one of the remaining pneumatics are collapsing. Each crank carries a roller 32 preferably of felt or like wear-resisting but durable material, held in their positions on the cranks by collars 33 on said cranks at each
 105 end of the rollers. The cranks for the two outside pneumatics are relatively narrow, while the cranks for the two center pneumatics are relatively long, since the connecting rods 34 for the slide valves are also attached to these two longer cranks. These connecting rods at their outer ends are loosely sleeved on the cranks and at their
 110 inner ends suitably connected to the slide valves as by a spring clip 35 or in any other suitable manner. Collars 36 on the cranks retain the rods 34 positioned. The pneumatics are expanded by the rollers 32 coming
 115 into engagement with the arms 37 one of which is carried by each pneumatic at the wide or expanding end thereof.

I find it advantageous, though not essential, to provide the crank wire with a balance 38, as it materially improves the running of the motor on light pressure and particularly so on high speed as it counterbalances the weight of the connecting rods 34, etc., and also balances the uneven distribution of weight in the crank wire.
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 130

The general operation of motors of this type is well understood by those skilled in the art, the motor being driven in a suitable manner, and air being admitted through both ports 17 and 18 as the slide valves alternately uncover these ports, the air being exhausted from the motor through the various channels and ports of a player mechanism until it reaches the main bellows of the player mechanism and is passed out through the feeders or pumps.

By the construction above described, I am enabled to maintain the motor within a relatively narrow compass, by reason of the location of the slide valves between the center and the outside pneumatics and upon the same side of the channel base as the pneumatics. In addition to this, the crank wire or shaft having certain of its cranks serving the double purpose of connections for the rods 34 and as cranks for expanding the pneumatics obviates providing additional cranks on the shaft and materially simplifies the construction.

I desire to call particular attention to the construction of the motor body embodying a metal base and a wood slide face, as in practice I have found that the metal base is of sufficient strength to effectually hold the wood slide face against twisting or moving in any manner which is vitally essential to proper working of motors of this type. This is particularly true when using a vitreous slide valve on a wood base as set forth in Patent 1,028,863 above referred to.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. In a pneumatic motor, a face member and a back member secured thereto, said back member provided with channels and an outlet port leading from one of said channels and said face member having ports, combined with pneumatics carried by the

face member and slide valves on the same side of the face member to cover and uncover said ports, and operating means for said valves and pneumatics.

2. In a pneumatic motor, a motor base comprising a face member and a back member, the face member having inlet ports, pneumatics carried by said face member, slide valves on the same face of said member, and means for operating said valves and expanding said pneumatics.

3. In a pneumatic motor, a motor base, pneumatics secured to one face thereof, and slide valves operating on the same face of said motor base.

4. In pneumatic motors, a motor base, pneumatics on one side of said base, slide valves on the same side of the base, certain of the pneumatics being spaced to provide for the slide valves operating therebetween, and means for operating the slide valves and expanding the pneumatics.

5. In pneumatic motors, a motor base, a plurality of pneumatics on one side thereof, a plurality of slide valves controlling the admission of air to the motor, said valves on the same side of the motor base as the pneumatics, and means for operating said slide valves.

6. In pneumatic motors, a motor base, pneumatics on one side of the base, slide valves controlling the admission of air to the motor, said valves on the same side of the motor base as the pneumatics and arranged between adjacent pneumatics, and means for operating the slide valves and expanding the pneumatics.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM F. COOPER.

Witnesses:

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BEN B. WICKHAM.