A. M. JACK.

PORTABLE AIR WITHDRAWING OR VACUUM PRODUCING APPARATUS.

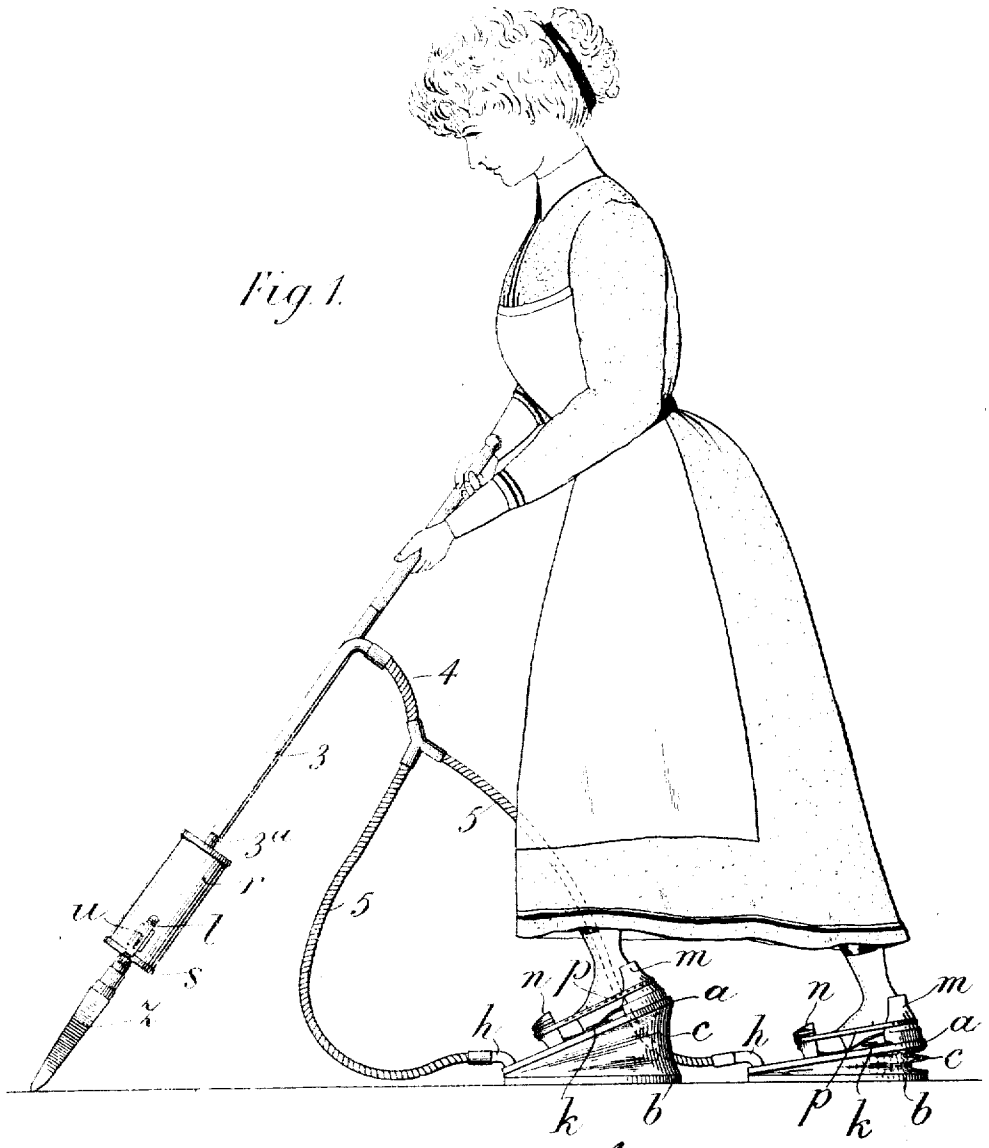
APPLICATION FILED JUNE 9, 1911.

1,016,830.

Patented Feb. 6, 1912

2 SHEETS—SHEET 1.

Fig. 1.



Witnesses
Sophie Stack
D. V. Winston

Inventor
Alexander M. Jack
By Sylvain C. Bouvé
Attorney

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2 SHEETS—SHEET 2.

Fig. 2.

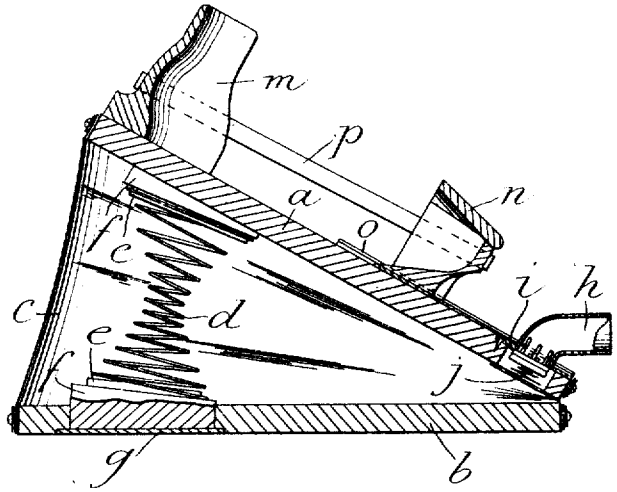
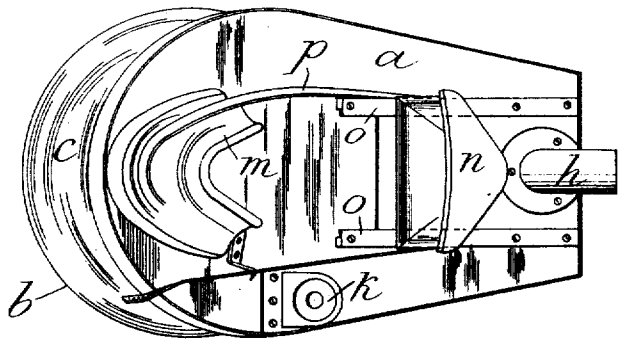


Fig. 3.



Witnesses
Geph. C. Stock.
D. D. Hinston.

Inventor
Alexander M. Jack
By Julian C. Howell
his Attorney

UNITED STATES PATENT OFFICE.

ALEXANDER MACKENZIE JACK, OF SHEFFIELD, ENGLAND.

PORTABLE AIR-WITHDRAWING OR VACUUM-PRODUCING APPARATUS.

1,016,830. Specification of Letters Patent. Patented Feb. 6, 1912.

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To all whom it may concern:

Be it known that I, ALEXANDER MACKENZIE JACK, a subject of the King of Great Britain and Ireland, residing at Sheffield, in the county of York, England, have invented Improvements in Portable Air-Withdrawing or Vacuum-Producing Apparatus, of which the following is a specification.

This invention has reference to air withdrawing or vacuum producing apparatus suitable for use in that kind of portable vacuum cleaning apparatus for removing dust from carpets and other articles, wherein the necessary vacuum is produced by bellows. Such vacuum cleaning apparatus as heretofore constructed with bellows or other air withdrawing devices operated by pedals or by hand, has, when being used by one person only, a small range of action so that the bellows or equivalent portion of the apparatus has to be frequently moved from place to place, as the cleaning proceeds, necessitating frequent interruption in the cleaning operation and involving liability of damage to furniture. These disadvantages can only be avoided or minimized by employing two persons to work the apparatus, one to operate the bellows or equivalent and the other to apply the suction nozzle or equivalent device to the carpet or other article to be cleaned, in which case a suitably long length of suction pipe is necessary to secure the desired range of action without frequent shifting of the bellows or equivalent. Such apparatus is therefore not adapted to be operated in an easy and convenient manner with the minimum of labor and so as to enable the desired cleaning by suction to be effected in a rapid manner.

Now the present invention has for object to provide improved air withdrawing or vacuum producing apparatus specially adapted for use in vacuum cleaning apparatus of the kind referred to, whereby such apparatus can be easily and conveniently used in a continuous manner by a single person and have an unlimited range of action with a comparatively short length of flexible suction tubing.

For this purpose the invention consists in the novel construction of bellows, constituting portable air withdrawing or vacuum producing apparatus, and in the combinations and arrangements of parts all as hereinafter more particularly described and pointed out in the claim.

In the accompanying drawings, Figure 1 shows vacuum cleaning apparatus of the kind referred to embodying bellows constructed according to the present invention, the said figure showing the manner of using such bellows. Figs. 2 and 3 show respectively in central vertical section and plan and to a larger scale than Fig. 1, one of the bellows used in such apparatus.

Air withdrawing means to constitute the exhausting portion of vacuum cleaning apparatus comprises, according to the present invention, as shown in Fig. 1, two entirely separate and independent bellows A and B adapted to be attached to the feet of the person using the apparatus and movable therewith from place to place and to be worked continuously by such person raising and depressing each leg alternately, either while remaining in the same position, or by and while walking about the room or other place in which the apparatus is being used, the opening movement of each bellows, to produce the suction or air exhausting action, being effected by one or more springs arranged within the bellows and the closing of the bellows, to discharge the air drawn into the bellows on the suction stroke, being effected by bringing the weight of the operator to bear upon the top of the bellows.

In the example shown each bellows comprises top and bottom boards *a* and *b* respectively that may be of the shape shown, or of other suitable shape, and are connected together by impervious flexible material *c*, such for example as leather, arranged to allow of the top board being moved toward and from the bottom board to form a bellows within which a spring device such as a coiled spring *d*, preferably of the double volute shape shown, is arranged to raise the top board, when relieved of pressure, and cause an exhausting action. The spring, which may be varied in strength to suit the operator's weight, can be held in place in any convenient way, as for example by projections *e* that enter the ends of the spring and are formed on blocks *f* fixed to the top and bottom boards. The spring and bottom block *f* are inserted

through a hole formed in the bottom board *b* and normally closed in an air tight manner by a plate *g*.

The bellows is provided with an air inlet *h*, with an air suction valve *i*, normally held against its seat by a spring *j*, and with an air delivery port and valve *k*. The top board *a* is hinged directly to the bottom board *b*, the air inlet *h* and suction valve *i* being carried by the top board. The top board *a* is provided with convenient means, such for example as clips, or straps, or both, by which it can be easily and conveniently secured to the operator's boot in such a manner as will permit of its being very quickly attached thereto and detached therefrom. In the example shown, each top board *a* is provided with a fixed heel piece *m* and a movable and adjustable toe piece *n* arranged to slide in guides *o*, a strap *p* serving to firmly fix a person's boot between the heel and toe pieces after insertion between them.

The means used for securing the bellows to a person's boots is such as to allow of the bellows being worn and moved by the person from place to place as indicated in Fig. 1. Also, both toe and heel pieces should be so shaped as to fit approximately either wide or narrow boots, the toe piece allowing of the use of either long or short boots.

In the case of hand operated bellows or equivalent devices, the muscles of the arm may soon become fatigued owing to their being called upon to perform novel or unusual duties. In operating bellows according to the present invention however, the muscles of the feet and legs are only called upon to perform work such as they are usually accustomed to. Consequently no novel or unusual muscular movements are involved by the operation which is carried out with a minimum of muscular fatigue. With the arrangement of bellows described, the hands of the operator are left free to manipulate the suction nozzle or, a combined suction nozzle and air filtering device, constituting part of the vacuum cleaning apparatus and which, in each case, is suitably connected to the bellows by flexible tubing, suction and delivery valves being provided in suitable positions to enable the apparatus to work in the well known way.

In the example shown in Fig. 1, *r* is an air filtering device of any suitable construction and *z* a suction nozzle. The air filtering device, whatever its construction, may conveniently be arranged between and suitably connected to the separate bellows A and B, and the suction nozzle *z* with which latter it may be combined, as shown, so as to form a combined air filtering device and suction nozzle that can be manipulated as one article by a suitable handle. In the example shown in Fig. 1, the upper end of the casing of the air filtering device *r* has a socket 3ª to which a handle, formed by an air outlet pipe 3, can be detachably secured so that the combined air filtering device *r* and suction nozzle *z* can be readily moved, by either hand, over the floor or other place from which dust is to be removed. The air inlet pipes *h* of the two bellows are connected to the air outlet pipe 3 by a pair of flexible tubes 5 and a single length of flexible tubing 4 which will allow of free movement of the combined nozzle and air filtering device, do not necessarily drag upon the ground, and will not hamper the operator. The air filtering device *r* is provided with an end cover *s* that is removably attached to lugs on the said device by hinged levers or handles, one lug and lever being indicated at *u* and *t* respectively in Fig. 1.

The bellows A, B, flexible tubes 4, 5, handle 3, air filtering device *r* and nozzle *z* are readily detachable one from the other to allow of their being conveniently packed up when not required.

What I claim is:—

The combination of a pair of independent bellows adapted to be secured severally to the feet of an operator whereby they may be moved from place to place while being operated, flexible piping connecting the suction inlets of the bellows, and a suction pipe connected to the said flexible piping at an intermediate point of the length thereof whereby a continuous inflow will be established through the suction pipe.

Signed at Sheffield, England, this 2d day of June, 1911.

ALEXANDER MACKENZIE JACK.

Witnesses:
RICE K. EVANS,
CHAS. N. DANIELS.