Feb. 16, 1937. W. R. COYNE ET AL 2,070,562

VACUUM PRODUCING DEVICE

Filed March 6, 1935

Fig. 1

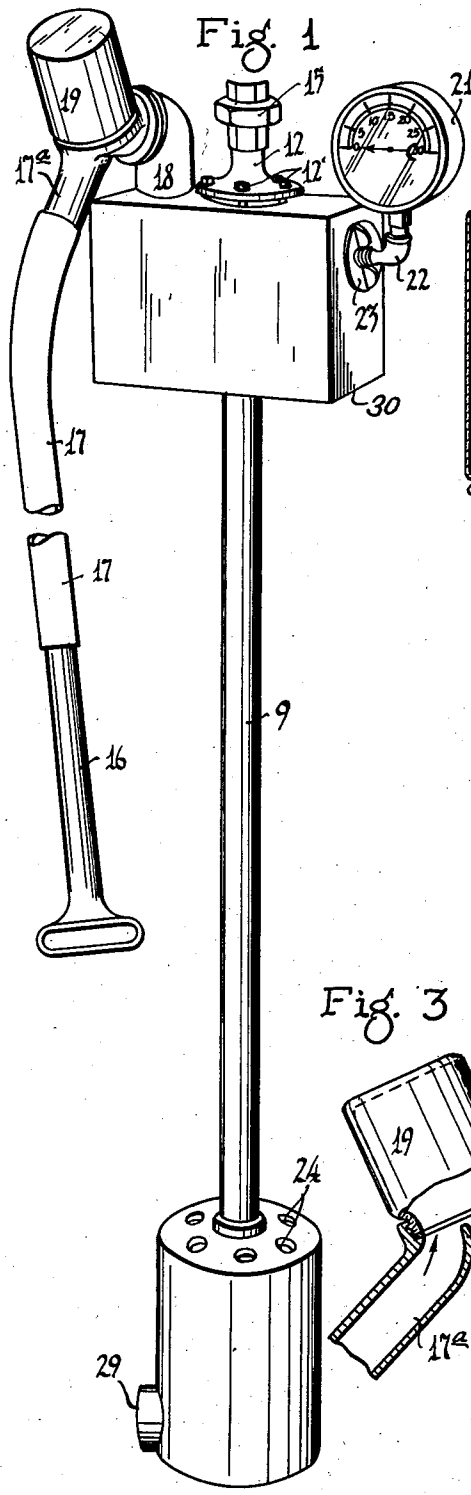


Fig. 2

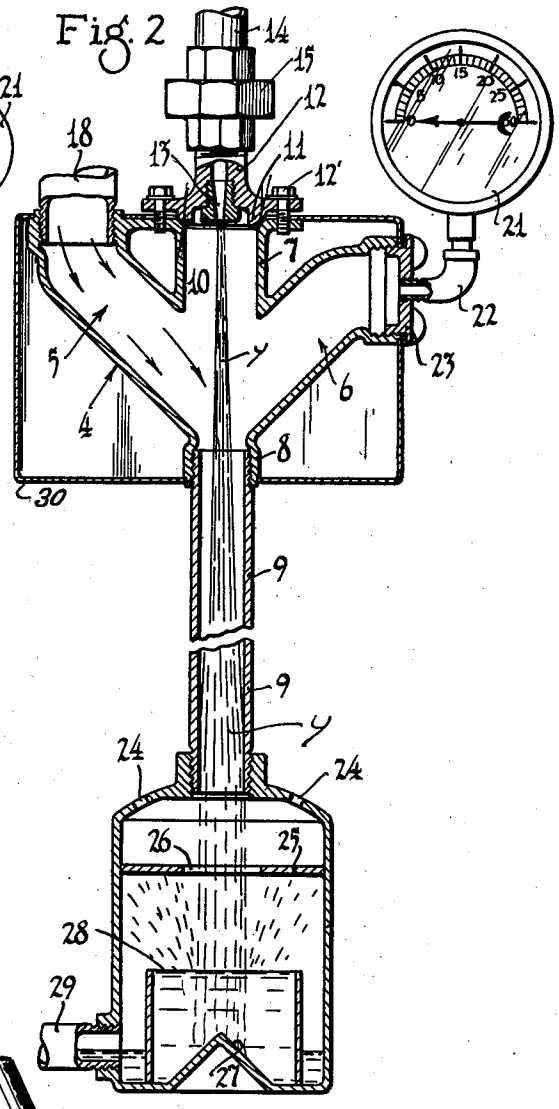
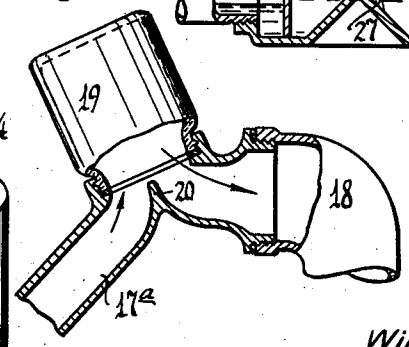


Fig. 3



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VACUUM PRODUCING DEVICE

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2 Claims. (Cl. 230—92)

Primarily, our invention has for its object to provide an extremely simple and highly efficient vacuum cleaner for picking up or collecting dust and separating the same from the air; but the invention is capable of various other uses such as for producing a forced circulation of water. The device is of the hydraulic type wherein partial vacuum or suction for picking up the dust is provided by a spray of water produced at high velocity.

A preferred form of the invention designed for use as a vacuum cleaner, is illustrated in the accompanying drawing, wherein like characters indicate like parts throughout the several views.

Referring to the drawing:

Fig. 1 is a perspective showing the complete device;

Fig. 2 is a transverse vertical section taken axially through the device, some parts being broken away; and

Fig. 3 is a detail partly in side elevation and partly in vertical section showing a part of the suction tube of the cleaner.

In this preferred arrangement, we provide a V-shaped hollow casing 4 constructed in conduit-forming prongs 5 and 6 and with an axially upwardly projecting neck 7 and with a depending internally threaded lower neck 8, to which latter is secured a depending tube 9. The sleeve 7, neck 8 and tube 9 constitute what is herein designated as an ejection conduit into the intermediate upper portion of which the suction conduits 5 and 6 open, leaving a relatively dead air chamber 10 within the upper neck 7. The upper neck 7, lower neck 8 and tube 9 are in axial alignment so as to bring all of the ejection conduit-forming portions in true axial alignment. At its extreme upper end, the upper neck 7 is formed with a seat against which the rounded boss 11 of a coupling head 12 is seated with freedom for locking adjustments. This head 12 has an outstanding flange through which machine screws 12′ are freely passed into threaded engagement with an outstanding flange on the upper end of the upper neck 7. An ejector jet 13 which is of very small axial passage, is applied to the head 12 preferably by screw-threaded engagement. The axial passage of this jet 13 is in axial alignment with the axis of the ejector conduit. By different adjustments or tightening of the screws 12′, the jet may be set so that the water spray *y* projected therefrom will be in true axial alignment with the interior of the tube 9 and will spread into complete contact with the walls thereof so as to have an air propelling action that may be likened to that of a continuously moving piston, see Fig. 2. Supply of water from a source under comparatively high pressures such as city water main, will be delivered to the head 12 and jet 13 through a lead pipe 14 shown as coupled to the head by a union 15.

A suction conduit 5 is connected to the device for picking up dust. This device is shown in the form of a pick-up nozzle 16, which by a rubber hose 17 or the like, is connected to a tortuous tube 17*a* which, in turn, is directly connected to the suction conduit 5 by an elbow 18. The numeral 19 indicates a glass jar shown as detachably connected to the intermediate portion of the tube 17*a*. By reference to Fig. 3, it will be noted that the tube 17*a* has an interior deflecting flange 20 which, as will presently be noted, causes the dust-laden air to pass more or less into the jar 19 so that the dust-collecting action may be observed. Of course, the elements just described may be greatly modified so far as the vital features of the invention are concerned. To the suction conduit or branch 6, a vacuum gauge 21 is shown as connected through an elbow 22 and a detachable head 23, which latter, as shown, is screw-threaded into the outer end of conduit 6. This vacuum gauge, while not an essential feature, is desirable to enable the operator to determine the amount of vacuum or suction that is being produced by the device. The lower end of the tube 9 is shown as connected into a can or chamber wherein the separation of the clean air from the dust and water is effected. This can is shown as provided at its top with a plurality of clean air discharge passages 24 and below said ports with a transverse-baffle 25 which has a large axial passage 26. The extreme bottom of the can is shown as provided with a raised conical surface 27 that is surrounded by an annular upstanding flange 28 spaced from the walls of the can. A water discharge pipe 29 leads from the bottom or lower portion of the can. The above described arrangement of the can and its interior parts may be greatly modified or eliminated so far as the broad idea of my invention is concerned.

The numeral 30 indicates a casing that closes the structure 5, 6, 7 and while not an essential feature, is desirable especially for appearance sake.

The operation of the device constructed as illustrated and described, is substantially as follows: The spray-like column of water *y* ejected from the jet 13 will, as stated and illustrated, completely fill the pipe 9, which constitutes the

lower portion of the ejection conduit and by a continuous forcing of the air downward through said conduit, will create a partial vacuum and a proper degree of suction in the conduit 5 and connections thereof to the pick-up nozzle 16. The dust of the dust-laden air will be first drawn into the upper end of the tube 9 and will be commingled with and picked up by the water spray and positively forced downward into the can or receptacle. The water laden with dust will be delivered into the bottom of the can while the clean air will escape through the ports 24. The dust-laden water will be dashed into a sort of a cup structure formed by the flange 28 and will overflow and finally run out of the drain or discharge pipe 29.

It is very important to note that the dust-laden air will not enter the chamber 10 formed within the upper neck 7 of the ejector conduit and hence is prevented from coming into contact with and clogging up the passage of the jet. This feature of arranging the suction conduit 5 for communication with the intermediate portion of the ejection conduit, thus avoids a difficulty hitherto encountered, to wit: the accumulation of dust and dirt on or around the jet with resulting clogging thereof.

As is clearly shown in Fig. 2, the ejector jet has a very small diameter as compared with that of discharge tube 9 and discharges a fluid column of gradually increasing diameter into the tube 9. The tube 9 is often of very great length, 6 or 8 feet for example, and in view of this great length, it is of very great importance that the column of fluid be projected in absolute alignment with the axis of the tube 9 if maximum vacuum producing efficiency is to be obtained and the full length of the tube 9 taken advantage of. This, of course, requires very accurate adjustment of the jet, especially when the tube 9 is of comparatively great length. Since these vacuum producing devices are shipped great distances where they are subject to rough handling and are often partially assembled on the job, it is very difficult to so adjust the jet at the factory that they will in all cases be properly adjusted when the device is finally installed, and hence the final adjustment of the jet must often be made on the job. The arrangement of the jet in respect to the other cooperating elements makes this desired final adjustment a very simple matter for layman or mechanic alike.

Attention is called to the important fact that the discharge end of the passage of the jet 13 is approximately in or slightly above the transverse plane of the engagement between the bearing surface 11 and its seat. Otherwise stated, the discharge extremity of said jet passage is so close to the neutral point or axis of rotation of said head, that the rocking adjustments of said head to align the water spray with the interior of the pipe or tube 9 does not to any perceptible extent shift the point of discharge of the jet in a transverse direction. Hitherto, it has been the practice to machine the bearing head and its seat with the intention of setting the water passage of the jet in alignment with the axis of the tube or passage into which the water spray is projected; but in practice, it has been found that this arrangement does not accomplish the desired result, for the following reasons: First, that it cannot always be determined in advance that a tube such as the tube 9 will always be in true axial alignment with the axis of an applied head and nipple, and in the second place, it has been found that the projection of the spray will be caused to drift more or less to one side if, for example, the water is delivered to the head through a curved pipe such as an elbow. The arrangement for adjustment described provides means for accurately setting the jet for the proper projection of the water spray.

The illustrated embodiment of the invention includes certain minor as well as major features, and it will be understood that the minor features may be very greatly varied within the scope of the invention and within the scope of the appended claims.

What we claim is:

1. In a device of the kind described, an ejector conduit involving an air chamber having an air intake and provided with a projecting discharge tube, in combination with a head seated in a wall of said chamber spaced from, but aligned with, the receiving end of said discharge tube, for universal rocking adjustments, and an ejector jet of very small diameter as compared with said discharge tube, the delivery end of said jet being so close to the neutral point or axis of oscillation of said head, that rocking adjustments of said head and jet do not materially shift the point of discharge from said jet transversely of said discharge tube, and means locking said head, with a fluid-tight joint, in different angular adjustments, so as to set said jet for proper delivery of a water spray into said discharge tube.

2. In a device of the kind described, an ejector conduit involving a tubular dead air chamber and, axially spaced therefrom, but aligned therewith, a discharge tube, and having between said tubular dead air chamber and discharge tube an expanded space with an air intake, in combination with a head seated at the receiving end of said dead air chamber, for universal rocking adjustments, in respect to said conduit, and an ejector jet of very small diameter as compared with said dead air chamber and discharge tube, the delivery end of said jet being so close to the neutral point or axis of oscillation of said head, that rocking adjustments of said head and jet do not materially shift the said point of discharge from said jet, transversely of said discharge tube, and means for locking said head, with a fluid-tight joint, in different angular adjustments, so as to set the said jet for proper delivery of a water spray into said discharge tube.

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