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DRAIN VALVE FOR AN AIR CLEANER

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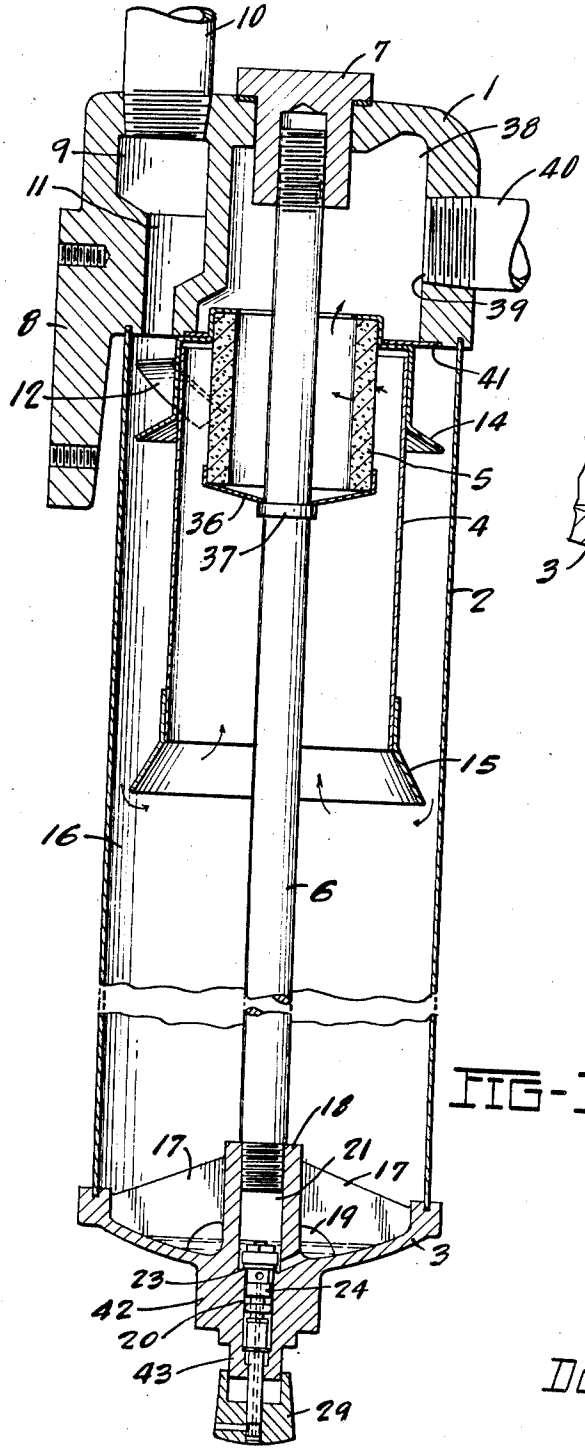



FIG-1-

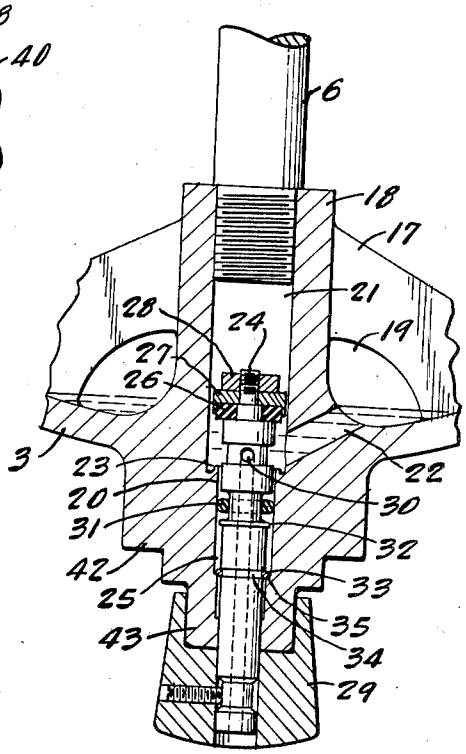



FIG-2-

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# DRAIN VALVE FOR AN AIR CLEANER

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Original application December 28, 1951, Serial No. 263,840, now Patent No. 2,692,655, dated October 26, 1954. Divided and this application June 17, 1954, Serial No. 437,525

3 Claims. (Cl. 137—590)

This invention relates to a drain valve for an air cleaner for compressed air and having means for removing entrained moisture from the air.

This application is a division of application Serial No. 263,840 filed December 28, 1951, now Patent No. 2,692,655 granted October 26, 1954, which relates to features of the air cleaner disclosed herein.

For many industrial purposes and particularly in regard to paint spraying operations, it is very desirable that compressed air be free of moisture, oil and dirt particles. Should such foreign matter be combined with a sprayed deposited coating not only is the appearance adversely affected but also the protective nature of the coating may be severely impaired. As water of condensation is most apt to be present in compressed air to an undesirable degree air cleaners for spray painting purposes are designed particularly to remove this material.

One object of the invention is the provision of an efficient drain valve for air cleaning devices having a simplified inexpensive compact design. Another object is the provision of easily manipulated drain valve means for the discharge of accumulated water.

A feature of the invention contributing to the accomplishment of the objects is the non-rotating axial movement of the valve.

Other objects and advantages will become apparent with the reading of the following description with reference given the accompanying drawings.

In the drawings:

Figure 1 is a vertical section of an air cleaner embodying my invention; and

Figure 2 is an enlarged vertical section of the drain valve components.

As shown in the drawings the air cleaner here presented includes a head member **1** formed from a casting. Depending from the head member is a tubular casting **2** on the lower end of which is a closure cap and valve casing **3**.

Concentrically positioned within the casing **2** is tubular partitioning member **4** and within the latter is the filter cylinder **5**. These various elements are held in assembled relation by a tie rod **6** threaded at its lower end to the closure cap **3** and at its upper end to a nut **7** inserted into the head **1**. Integral with the head is a flat faced mounting pad **8** by which the air cleaner may be secured in any desired location.

There is an air inlet passage **9** in the head which is threaded at its top portion to receive an air supply pipe **10**. The passage **9** terminates on the lower side of the head **1** in an elongated arcuate port **11**. Beneath this port is a vertically thin air directing blade **12**. This blade is secured at one end by a screw to the underside of the head **1** just beyond one end of the port **11** and slopes downwardly below the port **11**. The blade is sufficiently wide to quite completely bridge the space between the tubular casing **2** and the partitioning member **4** and extends downwardly until its lower end is closely adjacent to the upper surface of the outwardly extending annular flange **14** which is integral with the partitioning member **4**. The flange **14** extends sufficiently close to the inner surface of the casing **2** to leave only a narrow restricted annular opening therebetween.

Air flowing through air inlet passage **9** is forced by the blade **12** to travel in a circular path around the partitioning member **4** while progressively moving downwardly in a spiral path through the limited opening between the edge of the flange **14** and the casing **2**. The air continues its spiral travel past a second baffling flange **15** projecting outwardly from the lower end of the partitioning member **4**.



Beneath flange **15** the air expands in space **16** as it turns upwardly into the partitioning member **4**. The whirling action of the air as it travels downwardly between the casing **2** and the partitioning member **4** throws entrained particles of water, oil and dirt by centrifugal action against the inner surface of the casing.

The expansion of the air in space **16** also releases such entrained particles. The water with other matter deposited upon the casing wall flows downwardly into the well formed by the inner contour of the closure cap and valve casing **3** and is joined there by particles precipitated by the expansion of the air in space **16**.

For the purpose of strengthening the cap casting **3** there are vertical webs **17** between its periphery and the center post **18**. Adjacent the post in the lower portion of the webs are apertures **19** which permit accumulated liquid to pass freely through the webs around the post.

On the vertical axis of the cap **3** and through its center post **18** is a bore **20**. This has an enlarged upper portion **21** in which the tie rod **6** is threadedly engaged. The lower portion of the bore **20** extends into the stud **42** depending below the cap **3**.

Through the base of the post **18** providing communication between the interior water collecting well in the cap and the lower end of the enlarged portion of the axial bore is passage **22**. On the shoulder at the bottom of the enlarged bore is an annular ridge providing a valve seat **23**. A drain valve assembly **24** including a tubular valve stem **25** is fitted into the bore **20** for longitudinal movement.

The valve assembly has a resilient valve member **26** within a retainer **27** held on the upper closed end of the tubular valve stem **25** by a nut **28**. The valve member **26** is designed to have sealing contact with valve seat **23**. On the lower exteriorly extending end of the valve stem is fastened a finger knob **29** for moving the drain valve into open or closed position. Within an annular groove on the valve stem below the resilient valve member is a lateral port **30** for the passage of water into the interior of the tubular stem and downwardly into the atmosphere. The water is forced therethrough by the air pressure within the air cleaner when the valve is pushed into raised open position with the valve member **26** moved upwardly from the seat **23**.

To prevent leakage of water along the outside of the valve stem an O-ring packing **31** is carried in a peripheral groove **32** on the stem. To frictionally retain the valve in open position a compressed split ring **33** held in a second groove **34** on the stem expands over the shoulder **35** in the bore. The cylindrical boss **43** at the bottom of stud **42** fits into the finger knob **29** and acts as a stop for the upward movement of the valve. It also serves as a guide for the valve stem protecting it against any exterior deflecting force. After the valve is manually returned to closed position it is held there by the air pressure within the air cleaner as well as by the tension of split ring **33**.

The air with most of the entrained particles left behind moves upwardly within the partitioning member **4**. At the top of member **4** the air turns radially inwardly through the filter cylinder **5**.

The filter cylinder is a well known commercial type formed of layers of corrugated paper rings bound together by a phenolic resin. The great number of openings provided by the corrugations presents little restriction to the air flow while the openings are sufficiently small to stop any fine particles still carried by the air.

The cylinder **5** is held in place against the inwardly flanged upper end of member **4** by a retaining disc **36** which also closes the lower end of the cylinder. The disc in turn is supported by split ring **37** mounted in a groove in tie rod **6**.

The air continues through the open upper end of the filter cylinder into chamber **38** within head **1** and thence through outlet **39** to the point of use. A portion of a delivery pipe **40** is shown threaded into outlet **39**. The disc **36** is constructed with sufficient vertical give to permit firm sealing between the filter cylinder and the flanged upper end of member **4**, and between the latter and the

head, when the rod is threadedly engaged by nut 7 and cap 3. As the opening in the underside of the head 1 below chamber 38 is non-circular it is necessary to insert a ring 41 between the member 4 and the head to seal the air entering space between casing 1 and member 4 from the outlet chamber 38.

As may be perceived the discharge of accumulated water is easily handled with the slidable drain valve, and whether the valve is in opened or closed position may be quickly observed. The limited contact of the valve assembly 24 with the bore 20 assures easy manipulation and lessens the likelihood of binding due to corrosion, a common occurrence with threaded drain valves. The valve arrangement uses the pressure of the air to help hold the valve closed.

It should be understood that this invention is not limited to any specific construction as it is capable of embodiment in various forms within the spirit of the claims.

What I claim is:

1. In a liquid drain valve, a casing having an axial bore with an inlet at its upper end and open at its lower end, a reciprocable valve and an integral depending tubular valve stem in the bore, means providing an upwardly facing annular valve seat in the bore below the inlet, the tubular valve stem having at its upper end below the valve a lateral passage into its interior and having its lower end extending out of the bore and open for the discharge of liquid, a centrally-ported hand knob on the exterior portion of the valve stem for manual raising and lowering of the valve to open or closed relation with the valve seat, stop means limiting the upward movement of the valve, a compressed ring mounted on the valve stem, and a shoulder in the bore over which the compressed ring expands at the upward limit of the valve movement.



2. A drain valve according to claim 1 in which the stop means comprises a cylindrical boss on the lower side of the casing over which a complementary socket of the hand knob fits, the telescoping of the two parts also serving as a longitudinal protective guide for the valve stem.

3. A drain valve according to claim 1 in which there is an O-ring packing carried in a groove on the valve stem to seal between the stem and the bore.

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