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2,874,989

CONTROL FOR HOISTS

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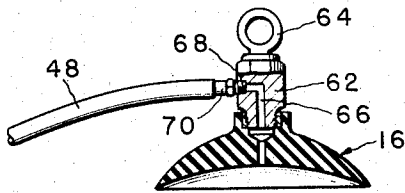


FIG. 3

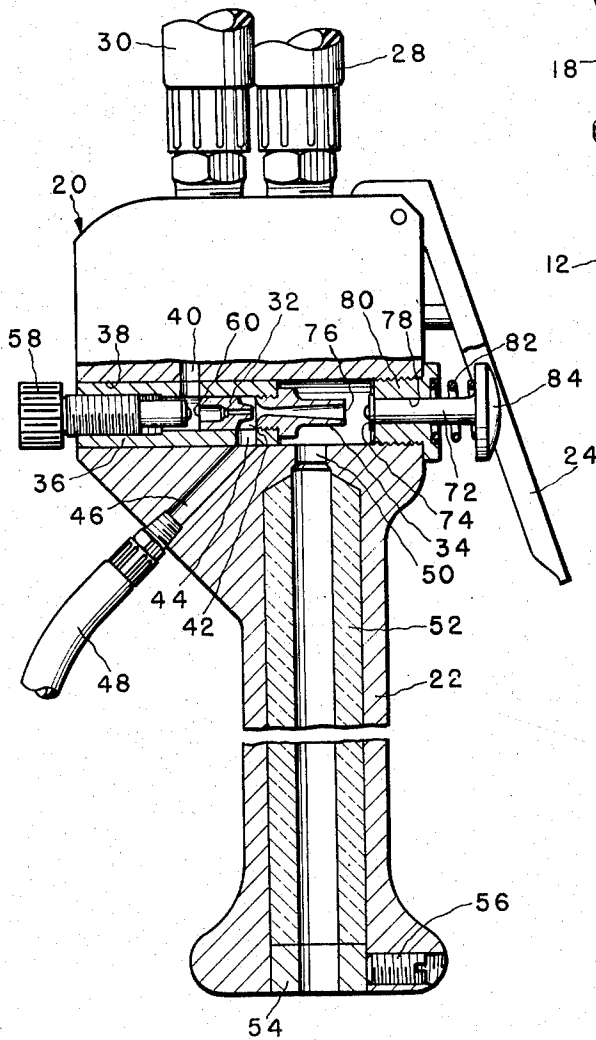


FIG. 2

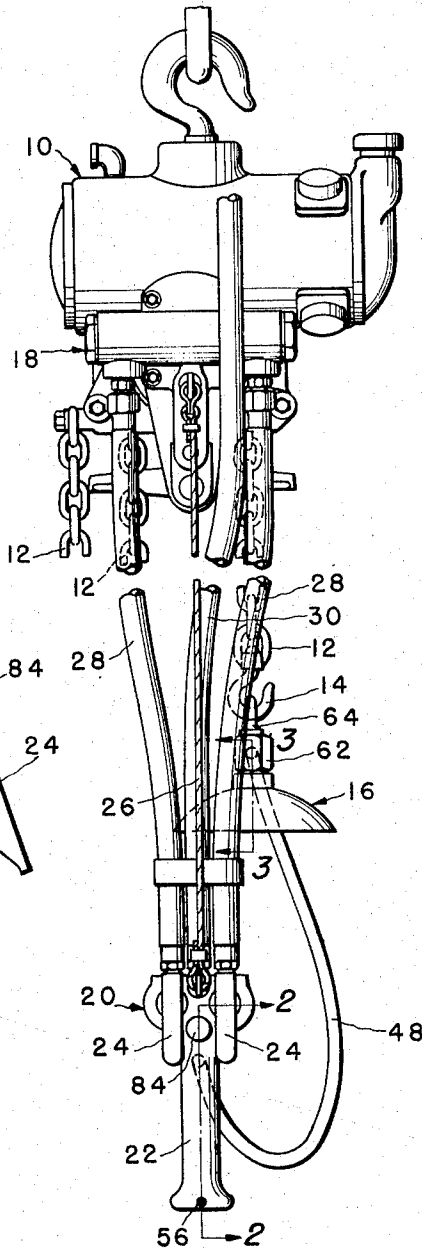


FIG. 1

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CONTROL FOR HOISTS

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2 Claims. (Cl. 294—64)

This invention relates to a suction cup lifting device and more particularly to a suction cup lifting device, the suction cup of which is evacuated by an air ejector.

One object of this invention is to provide an improved vacuum or suction cup as a readily engageable and disengageable connection between a hoist or other similar lifting apparatus and relatively bulky articles to be lifted.

Another object of this invention is to provide a suction cup lifting device which by simple manipulation of air pressure may be secured to an article to be lifted and positively detached from said article with ease and dispatch.

In the drawing in which similar reference characters refer to similar parts,

Fig. 1 is a side view of an overhead air motor chain hoist constructed in accordance with the practice of this invention, broken through the chain and connecting hoses, with attached suction cup and hoist control handle,

Fig. 2 is a longitudinal sectional view of the hoist control handle taken along line 2—2 of Fig. 1, looking in the direction of the arrows, and

Fig. 3 is a longitudinal sectional view of the suction cup taken along line 3—3 in Fig. 1, looking in the direction of the arrows.

The invention is shown associated with a conventional type of air hoist 10 which, for lifting purposes, is provided with a usual chain 12 and hook 14 for coupling to a suction cup 16. For operating the hoist a control mechanism is used which is of the type shown in detail in my copending patent application, Serial No. 239,263, filed July 30, 1951. The control mechanism consists of a housing 18 for valve mechanism as shown in that application. For operating the control mechanism there is provided a manually operable throttle valve 20 provided with a grip portion 22 and having a pair of levers 24 for selectively operating the valve mechanism. The throttle valve 20 is suspended from the hoist 10 by a suitable cord 26 and hoses 28 connecting the throttle valve 20 with the casing 18 of the control mechanism for feeding air to the control valve as described in the above mentioned application. A suitable compressed air supply hose 30 provides air to the throttle valve 20. Raising and lowering of the hook 14 is accomplished by selective operation of the throttle valve levers 24 in the manner described in detail in the aforesaid application.

Articles to be lifted by the hoist are adapted to be gripped by the suction cup 16 which is, in accordance with this invention, arranged to be evacuated or filled with air in a most effective manner. To this end a suction apparatus is provided in the throttle valve 20 which includes the air jet ejector having an air supply nozzle or jet 32 and a suitable diffuser 34 into which the jet discharges, both mounted in a sleeve 36 positioned in a bore 38 transverse of the throttle valve 20 and directed between the throttle levers 24. Air for the jet 32 is supplied from a passage 40 connecting with the main air supply from the hose 30. The suction chamber 42 leading to the intake of the diffuser 34 registers with a bore

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44 in the bushing 36 which likewise registers with a bore 46 in the body of the throttle valve 20. A suitable hose 48 coupled to the throttle valve body 20 at the bore 46 leads to the suction cup 16. The diffuser 34 is adapted to discharge into the bore 38 and thence to atmosphere through a port 50 leading to a hollow sleeve 52 mounted within the handle 22. The sleeve 52 is held in place by a thimble 54 secured in the handle 22 as by a suitable set screw 56. A diffuser as understood in the art is a passageway of decreasing area followed by an expanding portion somewhat like a Venturi tube. The portion of decreasing area often has a rounded approach as shown in the drawing and the size of the throat is designed to accommodate the flow of fluid, including the motive fluid and that evacuated from the suction chamber, at a velocity representing a drop in static pressure to that desired in the suction chamber or slightly below. The expanding part of the diffuser is designed to gradually reduce the fluid velocity and thereby increase the static head or pressure to that of the medium into which the ejector is arranged to discharge.

The degree of vacuum produced by the jet is dependent upon the supply of air thereto and to this end there is provided a regulating valve 58 adjustable by screwing into or out of the bushing 36 and correspondingly toward or away from the seat 60 provided at the rear face of the jet 32. The regulating valve is adapted to close off the supply of air entirely from the jet when the jet is not in use.

The suction cup 16 is supported by a coupling member 62 which not only serves for attachment to the hook 14 by means of the ring 64 attached at its top side but the coupling member 62 also has a passageway 66 leading to the concave face of the suction cup 16 and is threaded as at 68 to receive the hose coupling 70 at the end of the hose 48.

In normal operation, the jet ejector produces a vacuum by withdrawing air through the hose 48 and the valve 58 is left open. Articles may be suitably lifted by applying the suction cup 16 to a relatively smooth surface of the article (not shown). This forms a very effective way of carrying such articles about. Heretofore, the usual manner of releasing these articles from the suction cup 16 has been to cut-off the supply of motivating fluid by closing the air supply to the jet and allowing the air to reverse its flow from atmosphere back through the hose 48. This is not a very quick way to accomplish that result and accordingly this invention provides a means for supplying air under pressure to the hose 48 thereby accelerating the releasing action. This is accomplished in this embodiment by providing a thumb-operated plunger valve 72 having a head 74 adapted to be seated upon the open end 76 of the diffuser 34. The plunger 72 is, therefore, adapted to fit slidably in a bore 78 formed axially with respect to the diffuser 34 in a plug 80 closing one end of the bore 38. Normally, the head 74 is kept off the seat 76 by a coil spring 82 seated on the outer face of the plug 80 and bearing against a button-like head 84 on the plunger 72.

In operation, the suction cup 16 is placed against the smooth surface of an article to be lifted whereupon automatically the suction produced by the constant removal of air through the pipe 48 causes the cup 16 to adhere to the surface. By operation of the hoist 10, the article is, of course, then lifted and removed to the place desired and lowered to the position where it is to rest. The suction cup is thereupon ejected from the surface of the article by the operator who, for this purpose, presses on the button-like head 84 of the plunger 72 to shut-off the discharge from the diffuser 34 whereupon the air under pressure is discharged from the jet 32 into the pipe 48 to develop pressure within the cup 16.

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This device has been proven to be very satisfactory, quick acting and always effective and, as described above, accomplishes the objects hereinbefore set forth.

I claim:

1. In a suction cup lifting device a housing, a suction cup, an air jet ejector mounted in the housing and comprising a nozzle, a suction chamber and a diffuser, a conduit connecting the suction cup to the suction chamber for fluid flow therebetween, the housing having an exhaust passage therein communicating with the diffuser for fluid flow, and a spring pressed plunger extending into the housing in alignment with but normally out of engagement with the diffuser and provided with a head to close the end of the diffuser when actuated against such spring pressure to cause fluid to flow from the nozzle into the suction cup.

2. In a suction cup lifting device a suction cup, a housing having a projecting handle portion, an air jet ejector mounted in the housing and comprising a nozzle, a suction chamber, and a diffuser, a conduit connecting the suction

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cup to the suction chamber for fluid flow therebetween, the housing having an exhaust passage therein and extending through said projecting handle portion communicating with the diffuser for fluid flow and a thumb operable spring pressed plunger extending into the housing in alignment with but normally out of engagement with the diffuser and provided with a head to close the end to the diffuser when actuated against such spring pressure to cause fluid to flow from the nozzle into the suction cup.

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