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Kirsch

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[54] **APPARATUS FOR VACUUM PICK-UP OF POROUS MATERIALS**

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[52] **U.S. Cl.** .....**214/1 BS,** 294/64

[51] **Int. Cl.**.....**B66c 1/02**

[58] **Field of Search**.....294/64, 65; 214/1 BV, 1 BH, 214/1 BS, 1 BT, 8.5 D

[56] **References Cited**

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Assistant Examiner—George F. Abraham
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[57] **ABSTRACT**

Porous materials, such as cloth or unglazed ceramics or porous plastics which on account of their porosity defy ordinary vacuum pick-up, are made temporarily imperforate by applying to them a temporary coating of liquid, such as water, whereupon their porosity is momentarily sufficiently inhibited to permit their pick-up and transfer by suction, as by a suction cup device. The liquid coating is deposited either by rolling or spraying the liquid onto the porous material either from above it (FIG. 1) or from beneath it either for a single layer (FIG. 2) or for a plurality of layers thereof (FIG. 3).

6 Claims, 3 Drawing Figures

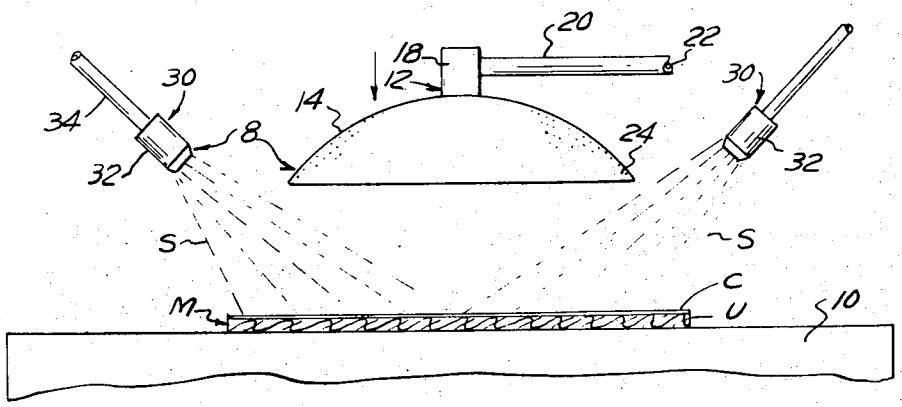


FIG. 3

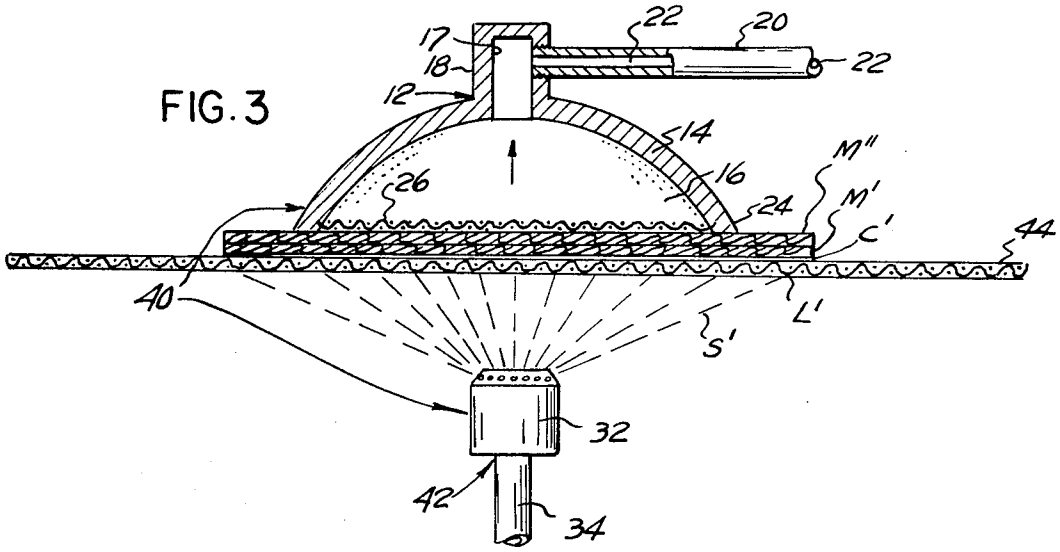


FIG. 1

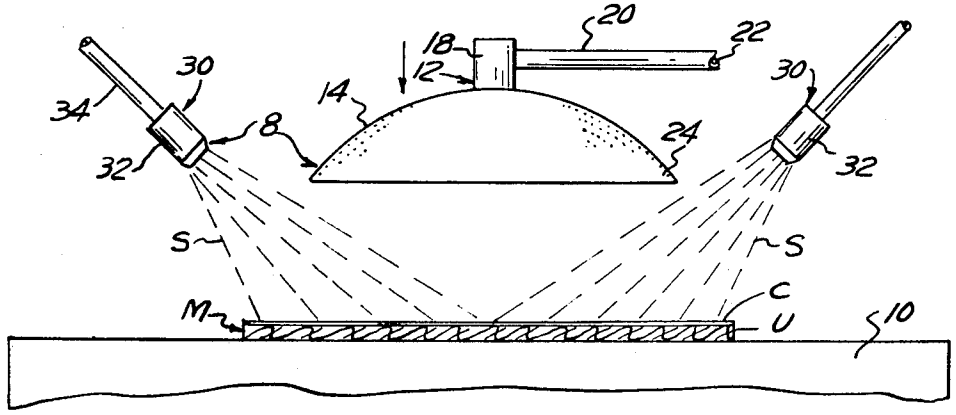
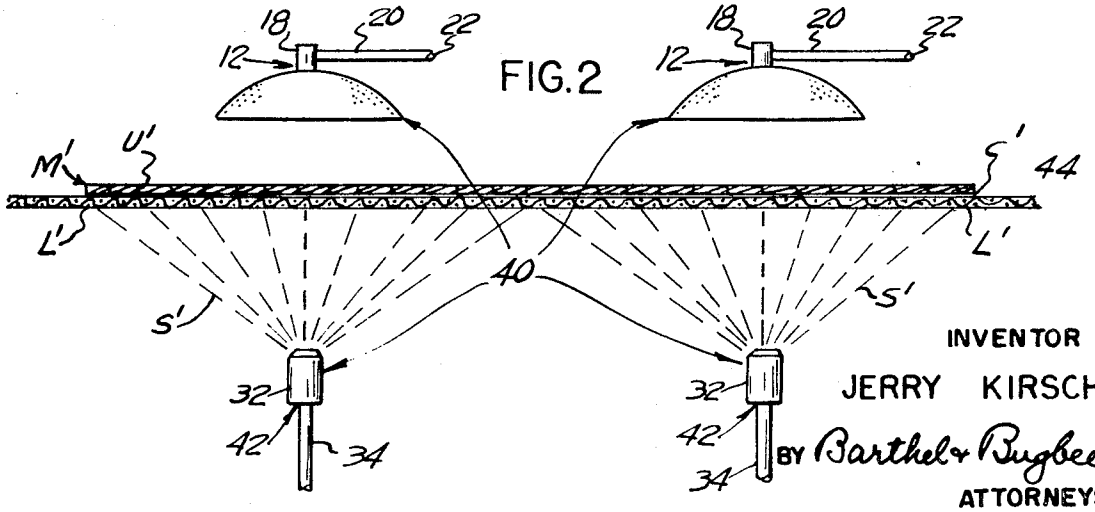


FIG. 2



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APPARATUS FOR VACUUM PICK-UP OF POROUS MATERIALS

BACKGROUND OF THE INVENTION

Hitherto, the picking up and moving of porous materials such as cloth from one point to another has been very difficult because of the fact that the porosity of the cloth or other porous material, such as ceramic articles, allows the air to pass through the material and thus does not permit a vacuum to build up sufficiently for the porous material to be retained by suction on a vacuum cup or against a vacuum chamber. Where large volumes of air are exhausted in order to create a vacuum sufficient to lift small or light-weight pieces of cloth or other porous material, the expense of furnishing the power required for the development of a sufficient suction has proved to be prohibitive.

SUMMARY OF THE INVENTION

The present invention by spraying, rolling or otherwise coating a cloth or other porous material with a liquid that either dries or remains in a liquid state sufficient to temporarily inhibit the air flow through the pores permits the material to be picked up by a vacuum device and transferred to the desired location before the porosity reoccurs.

In the drawings:

FIG. 1 is a diagrammatic view of one form of means and method for the vacuum pick-up and transfer of porous material, by applying a liquid coating from an overhead spray source to the upper surface of the material;

FIG. 2 is a diagrammatic view of the modification wherein the liquid coating is applied to the lower surface of a single layer of porous material; and

FIG. 3 is a view similar to FIG. 2 but showing in cross-section the lifting of a plurality of layers of porous material by applying a liquid coating to the lower surface of the lowermost layer thereof.

Referring to the drawings in detail, FIG. 1 shows an apparatus, generally designated **8**, for lifting and transferring a piece M of porous material from a substantially imperforate support **10**, such as a table or conveyor, to another location (not shown by means of a vacuum cup device **12**. The latter is shown diagrammatically for purposes of simplicity as consisting of a resilient cup **14** of elastomeric material, such as natural or synthetic rubber or resilient synthetic plastic, having a suction chamber **16** in its interior connected through a passageway **17** in a hollow stem **18** to a tubular arm **20** the bore **22** of which is connected to a suction source such as a vacuum pump (not shown) or other means for producing a vacuum within the vacuum chamber **16**.

As shown more fully in cross-section in FIG. 3, the vacuum cup device **12** is provided at the rim **24** of the cup **14** with a perforated or reticulated wall **26** through which air can pass but which prevents the porous material M from being drawn into the chamber **16** by the air being withdrawn through the passageway **28** within the pipe or hose **22**. The vacuum cup device **12** is provided with conventional means (not shown) for raising and lowering it by the tubular arm **20** as well as swinging it from one location to another, such as from a pick-up station to a deposit station. Such means which has been found successful for this purpose is disclosed

and claimed in the Kirsch and Robb U.S. Pat. No. 3,406,837 issued Oct. 22, 1968 for Lifting and Swinging Work Transfer Device.

The lifting and transferring apparatus **8** is provided with liquid coating means **30** such as spray heads or nozzles **32** connected to liquid supply pipes **34** for supplying and projecting a liquid spray S upon the upper surface of the material M. The liquid spray S may conveniently consist of water supplied under pressure through the pipes **34** to the spray heads **32** which in turn propel it downward upon the upper surface U of the material M, which ordinarily is porous sheet material.

In the operation of the lifting and transferring apparatus **8**, let it be assumed that the pieces of material M have been deposited on the upper surface **34** of the support **10** and are to be lifted and transferred to another location. In accordance with the present invention, water or other suitable liquid is projected in the form of a spray S upon the upper surface U of the material M, whereupon the transfer mechanism is caused to lower the vacuum cup device **12** so that its rim **24** engages the upper surface U which has been rendered temporarily non-porous or imperforate by the coating C of liquid momentarily filling up the pores. As a result, the suction is enabled to build up within the chamber **16** inside the cup **14**, which in turn causes the material M to adhere to the rim **24** thereof. As a result, the raising of the vacuum cup device **12** by the tubular arm **20** causes the piece of material M to be lifted therewith and transferred to a place of deposit before the liquid coating C disappears from the pores. The reversal of the vacuum pumping action within the vacuum cup chamber **16** causes the material M to be released and dropped onto the conveyor or into the tote box or other place of deposit of the transferred material M.

The modified porous material lifting and transferring apparatus, generally designated **40**, shown in FIG. 2 employs similar vacuum cup devices **12** to the vacuum cup device **12** described above in connection with FIG. **1**. In FIG. **2**, a plurality of the vacuum cup devices **12** are employed because of the greater length of the porous material article M'. Similarly, a plurality of liquid coating means **42** placed beneath the porous material M' deposit the liquid coating C' on the lower surface L' thereof through a perforated support **44** such as a wire screen panel or conveyor belt. The liquid coating means **42** may employ the same or similar spray heads **32** and liquid supply pipes **34** as are described above in connection with FIG. **1** to discharge liquid sprays S' upward instead of downward as in FIG. **1**. It will be further understood that the tubular arms **20** of the vacuum cup devices **12** of FIG. 2 are similarly incorporated in a lifting and swinging device (not shown) such as has been mentioned above in connection with FIG. **1**.

In the operation of the lifting and transferring apparatus **40** of FIG. **2**, let it be assumed that the piece of material M' has been placed upon the screen member **44**, such as a screen panel or conveyor belt, and that the spray heads or nozzles **32** have been activated to project liquid sprays S', such as water sprays, upward through the wire screen panel or belt **44** to deposit the liquid coating C' on the lower side L' of the material

M', temporarily closing up the pores thereof. While the pores are thus closed, the vacuum cup devices **12** are lowered by their tubular arms **20** into contact with the upper surface U' of the material M' and suction created therein, whereupon the subsequent lifting and swinging of the vacuum cup devices **12** also lifts and swings the porous material M' off the screen panel or belt **44** and transfers it to the desired place of deposit. The reversal of the suction in the vacuum cup devices **12** breaks the vacuum in the chambers **16** thereof. As a result, the porous material piece or article M' is ejected and dropped onto the place of deposit or disposal.

The arrangement shown in FIG. **3** is similar to that of FIG. **2** and is consequently designated with the same reference numerals. In FIG. **3**, however, the lifting and transferring apparatus **40** is applied to the lifting and transferring of a plurality of layers of material M' and M''. The spray head or nozzle **32** of the liquid coating means **42** is similarly placed beneath the wire screen panel or belt **44** where it deposits the liquid coating C' on the lower side L' of the lowermost panel or sheet of material M'. In this manner, the depositing of the single coating C' suffices to render temporarily substantially imperforate a stack or pile of pieces of material M' and M'' so that they will be lifted as a unit by the tubular arm **20** the vacuum cup device **12**.

I claim:

1. An apparatus for the vacuum pick-up of a porous material, comprising

an approximately horizontal support adapted to receive and sustain the material,

a liquid depositing device disposed adjacent said support and constructed and arranged to deposit a liquid layer on said material,

a vacuum cup device disposed above said support in spaced relationship thereto and having a suction chamber therein,

and means adapted to be connected to a suction source and connected to said vacuum cup device for raising, lowering and swinging the same relatively to said support.

2. An apparatus, according to claim **1**, wherein the liquid depositing device is disposed above said support adjacent said vacuum cup device, and wherein the liquid from said liquid depositing device is deposited upon the upper surface of the material.

3. An apparatus, according to claim **1**, wherein the support is a substantially imperforate member.

4. An apparatus, according to claim **1**, wherein the liquid depositing device is disposed below said support on the opposite side thereof from said vacuum cup device.

5. An apparatus, according to claim **1**, wherein the support is a perforated member, and wherein the liquid from said liquid depositing device passes therefrom through the perforations of said perforated member onto the lower surface of the material.

6. An apparatus, according to claim **1**, wherein the liquid depositing device is a spray nozzle.

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