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M. WATTER

2,725,255

SLIP RESISTANT VACUUM CUPS

Filed Aug. 12, 1953

FIG.3

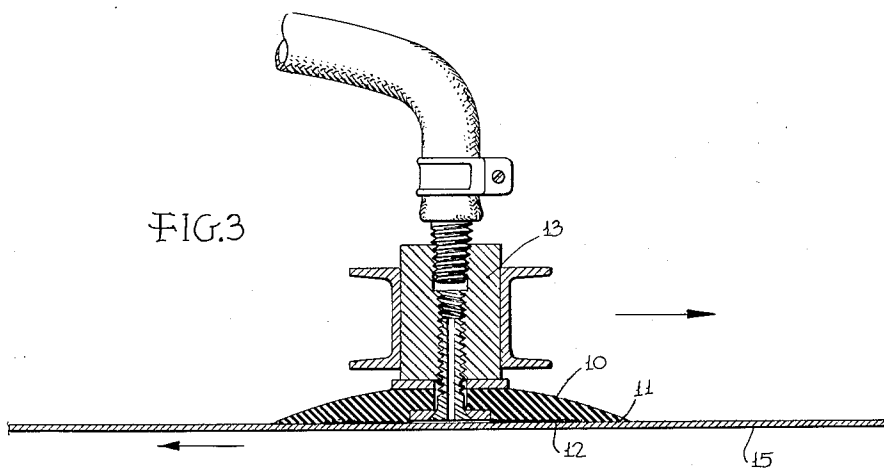


FIG.2

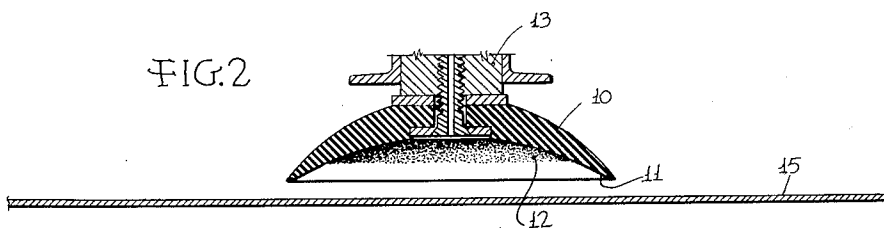
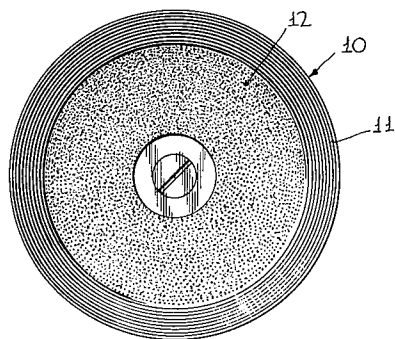


FIG.1.



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## SLIP RESISTANT VACUUM CUPS

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1 Claim. (Cl. 294—64)

This invention relates to slip resistant vacuum cups and has for an object the provision of improvements in this art.

One of the objects of the invention is to provide a vacuum or suction cup which has the usual lifting ability and which at the same time resists lateral movement along a sheet being lifted even when the sheet is covered with a material such as oil, water or the like which normally causes vacuum cups to slide along the surface when forces are exerted in this direction.

Another object is to provide a vacuum cup which has good lifting characteristics and resistance to surface slip, yet which is inexpensive to make and durable in service.

The above and other objects and advantages of the invention will be apparent from the following description of an exemplary embodiment, reference being made to the accompanying drawings thereof, wherein:

Fig. 1 is a face plan view of a vacuum or suction cup embodying the invention;

Fig. 2 is an axial section showing the cup ready to engage a sheet; and

Fig. 3 is a similar section showing the vacuum cup applied to a sheet.

As vacuum cups are normally used, the rubber or rubber-like edge obtains a good seal with the surface of a sheet which is to be lifted and if the surface of the sheet is dry there will be good frictional engagement between the cup and the sheet which will satisfactorily resist forces applied parallel to the surface of the sheet tending to produce slippage of the cup along the sheet. For most uses of vacuum cups only dry sheets are encountered. However, when the attempt is made to feed greased metal sheets used in sheet forming press work, the cups often slip along the surface of the sheets. This is objectionable when positive side movement, quick starts and stops, and accurate positioning of sheets are desired.

According to the present invention the vacuum cup, which comprises a body portion 10 and a thin smooth outer edge 11 is provided interiorly with a non-skid surface 12 of a material which resists slippage along the surface of the sheet being lifted. A gritty or abrasive material, may for example, be used for greasy metal sheets. The non-skid surface is disposed at a distance from the

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outer edge of the vacuum cup so that this outer edge may maintain a tight leak-proof seal at all times. There may, for example, be a half inch or more of smooth edge, depending on the size of the cup.

The cup is supported by a tube 13 by which the cup is pushed down and lifted and through which air may pass, either to create a vacuum to cause the cup to adhere to a sheet or to admit air to cause the cup to be released, or both.

Fig. 3 shows how the non-skid surface is brought into engagement with the surface of a sheet 15 after the outer edge has been bent sufficiently. This figure also indicates by arrows the direction of forces which may be encountered tending to slide the cup along the sheet.

It has been found that cups made according to the present invention have all the lifting power of normal cups and at the same time resist very strongly any tendency to slip along a sheet even when very strong forces are applied in this direction.

While rubber is referred to as the material used for the vacuum cups, it will be understood that other flexible resilient materials having like characteristics for the intended purposes may be used. For example, when oily sheets are to be handled the cups may be composed of "neoprene" or other material which is not injured by the oil. Again, the entire cup is shown to be formed of rubber but if greater strength is desired the body may be reinforced with a stronger flexible material such as steel sheet, or indeed the entire cup except for the flexible gripping outer edge may be formed of a material other than the rubber-like material used for the outer edge.

One embodiment has been described for purposes of illustration but it is to be understood that there may be other embodiments within the general scope of the invention.

What is claimed is:

A vacuum cup comprising a body portion, a resilient flexible edge portion of a rubber-like material adapted to form a seal with the surface of the article to be lifted, and a surface-exposed annular zone of a dry gritty non-skid abrasive material bonded to the inner surface of the cup and disposed within and at a distance from the periphery of the cup and which is brought into engagement with the surface of the article when it is gripped by the vacuum cup for resisting slippage along the surface of the article.

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