Jan. 12, 1965 B. BORISOF 3,165,283

ADHESIVE DEVICE

Filed July 22, 1963

FIG. 1

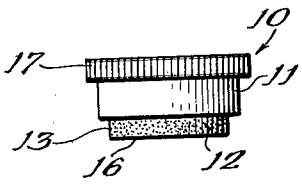


FIG. 2

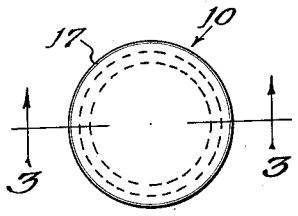


FIG. 3

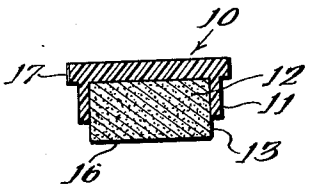


FIG. 4

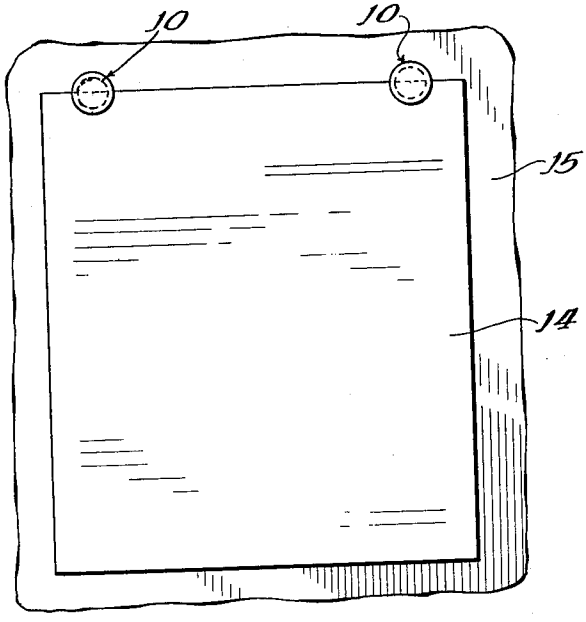


FIG. 4a

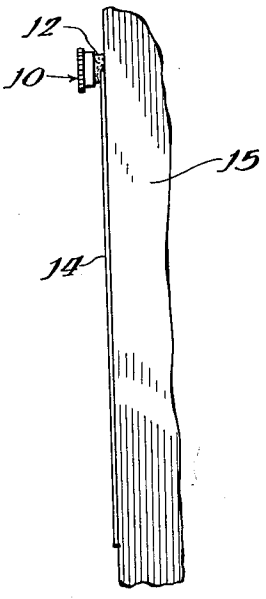


FIG. 5

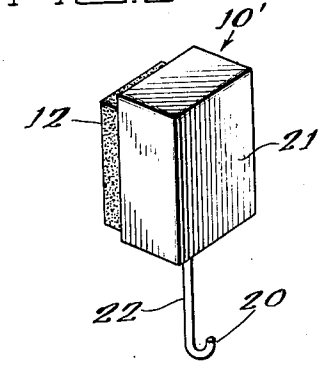


FIG. 6

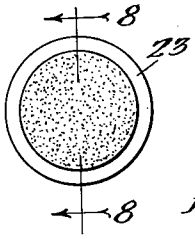


FIG. 7

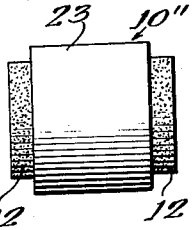
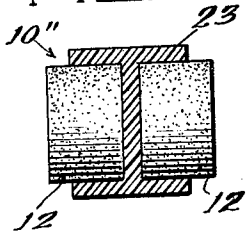


FIG. 8



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3,165,283

ADHESIVE DEVICE

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7 Claims. (Cl. 248—29)

This invention relates to a removable and re-usable adhesive fastening device for holding posters, bulletins, decorations, and other similar articles on windows, walls, or any other surfaces.

It is customary to mount posters and signs with pressure sensitve adhesive tape. This requires two hands to tear off pieces of the tape, making it awkward for the user who is meanwhile attempting to hold the poster in position. If placed on the poster in advance, the pieces of tape often fold over and stick to themselves. Often, such tape undesirably comes loose from cold or wet surfaces due to the difference in expansion of tape and surface on which it is mounted. Otherwise, if it does adhere to a surface for a long time, the tape is difficult to remove, requires scraping with a razor. In general, such tape cannot be removed from paper articles without tearing them. For mounting sales descriptions on merchandise, tape is unsightly and detracts from the appearance. Pressure sensitive tape is generally not re-usable, and it cost tends to be high, especially in school rooms where hundreds of items are hung on walls, windows and blackboard.

Tacks, thumbtacks, and staples are also used for supporting signs, posters, and similar notices. These fasteners have drawbacks in that they leave holes; and cannot be used at all on hard surfaces like glass, blackboards, or metal. Thumbtacks require soft bulletin boards, and are a hazard when dropped. Tacks and staples require tools to install and tools for removal. These fasteners require too much effort for putting up temporary memos in home or office.

The present invention aims to overcome the above disadvantages by providing a new and better fastening device for holding posters, signs, bulletins, memos pictures, decorations, calendars, and other articles on walls, windows, or other surfaces.

It is an object of the invention to provide a fastening device which may be readily placed in position, using only one hand, only finger-tip pressure, and requiring no tools.

Another object is to provide a fastener which will hold on glass, wood, metal, paper, paint, cloth, or any other surface, whether hard or soft, or rough or smooth.

Another object is to provide a fastener which will adhere indefinitely to the surface to which it is applied regardless of ordinary temperature changes or the presence of moisture.

Another object is to provide a fastener which may be removed readily with finger-tips and does not mar the surfaces to which it has been attached.

Another object is to provide a fastener which is reusable hundreds of times.

A further object is to provide a fastener whose initial cost is extremely low and which is neat in appearance.

Other objects, features and advantages of the invention will become apparent as the description proceeds.

FIG. 1 is an elevation showing a preferred embodiment of my invention;

FIG. 2 is a plan view thereof;

FIG. 3 is an elevation taken along line 3—3 of FIG. 2;

FIG. 4 is an elevation showing an application of the invention;

FIG. 4*a* is a side end view of FIG. 4;

FIG. 5 is a perspective view showing a modification;

FIG. 6 is an end view of a further modification;

FIG. 7 is a side elevation of FIG. 6; and

FIG. 8 is a section taken along line 8—8 of FIG. 6.

With reference now to FIGS. 1 and 2, the adhesive device **10** comprises a cup **11** and a body **12** of tacky plastic material disposed within the cup and adhered to the inside of the cup. The physical characteristics of the body of material **12** are similar to that which is associated with the term "mastic," which term is used herein to designate the body **12** of the material. The mastic has a volume greater than the capacity of the cup so as to provide a workable portion **13** which projects from the open end of the cup.

The cup **11** is preferably a molded part of synthetic resin, but it may be formed of any suitable constraining material such as metal, wood, or heavy paper which adheres to the mastic.

The mastic consists essentially of a base material such as a microcrystalline wax having a melting point of 165° F., or a polyisobutylene of a suitable degree of hardness, or any other adhesive material which retains its shape at ordinary temperatures, is pressure-sensitive adhesive, pressure deformable, non-resilient and pliable, non-volatile and non-setting, and which retains these properties upon removal and reapplication to a selected surface.

A preferred example is microcrystalline wax of a melting point of 165° F., ASTM needle penetration of 23 at 77° F., and oil content of 5%.

Other examples are as follows:

(1)

	Parts
Microcrystalline wax, M.P. 165°	100
Terpene resin (Piccolyte)	30

The terpene resin adds tackiness, and the proportion can be varied through the range of from 10 parts to 70 parts per hundred parts of microcrystalline wax base. Instead of terpene resin, other substances can be substituted in the same proportions, such as cumar resin, butyl rubber, or natural rubber.

(2)

	Parts
Polyisobutylene (10,000 mol. wt.)	50
Polyisobutylene (80,000 mol. wt.)	50
Terpene resin	25
Polyethylene resin	5

The proportions of the tackifying agent, such as terpene resin or the other substances mentioned in Example 1 can vary from 10 to 50 parts.

The polyethylene resin increases the tensile strength; the proportions can be varied, and the polyethylene is not always necessary depending upon the hardness and tensile strength of the polyisobutylene base. The proportions of this additive can vary from zero up to 30 parts per 100 parts of base. Polyvinyl resin may be substituted for polyethylene in the same proportions.

The polyisobutylene base in this instance is a half and half mixture of high and low molecular weights representing relatively hard and relatively soft substances respectively. The proportions of the mixture may be varied within limits of 10% either way, or even greater if the variations in the hardening agents are modified correspondingly. In the alternative, a polybutylene of medium molecular weight such as 45,000 may be substituted for the mixture.

Fillers can be used in any of the above examples, such as wood fibers, cotton linters, clay, zinc oxide or the like. For instance in Example 1, 30 parts of cotton fibers can be added.

One or more of these devices **10** may be used to fasten an article to a surface. For example, in FIGS. 4 and 4*a*,

a poster 14 is retained on a wall 15 by two adhesive devices 10.

The operation is as follows: The poster 14 is placed in the desired position against the wall. Then the device is positioned so that it overlaps the edge of the poster 14, and the cup 11 is pressed so that the mastic 12 adheres to both the wall and the poster.

The device lends itself readily to this method of application. A number of the devices may be carried in a pocket for handy use. The device is positioned with one hand and finger tip pressure completes the fastening. The whole process takes about a second and is surprisingly fast compared to other adhesive fastening methods.

Since the mastic retains its shape and is non-free flowing, in order to effect a permanent bond not subject to creep and failure, unit pressure involved in deforming the material is relatively high. Therefore, to afford ease of application of the device with one hand, it is desirable that the area of surface 16 be less than two square inches, and preferably a quarter of a square inch.

When the device makes its first contact with a surface, the workable portion 13 yields readily and the tacky adhesive surface 16 conforms itself to the mounting surface. The workable portion 13 may flow laterally until the width of the gap between the edge of the cup and the wall 15 becomes small enough to offer sufficient resistance to the lateral flow of the viscous material as to create a condition of equilibrium representing a substantial fluid pressure within the cup 11. This results in a good bond which extends throughout an area equal to the cross sectional area of the cup. The increase of pressure is also believed to increase the tensile strength of the mastic 12 at points near the surface 16, somewhat analogous to work-hardening.

The adhesive device can be removed and reused. Unlike adhesive tapes, which must be peeled for removal and thus tear paper articles, this device may be twisted for removal. The twisting motion produces a sliding action at the interface of the mastic and the surface to which it is adhered, readily releasing its bond, and leaving the surfaces unmarred.

It is desirable that the back of the cup be wider than its diameter at the opening to afford a better grip. In a preferred embodiment, the device has a knurled flange 17 to facilitate removal by twisting. A cup of rectangular or other non-circular shape can also be twisted readily.

An essential feature of the device is the adhesion between the mastic portion 12 and the cup 11, so that when the device is removed from a surface to which it has been attached the mastic will be retained in the cup, and will not be left on the surface. The area of adhesion within the cup exceeds area 16 by the area of the side walls of the cup, thus providing for greater adhesion of the mastic inside the cup than at surface 16. This internal adhesion is further enhanced by the packing of the mastic between the side walls. This internal packing and adhesion can be further increased by providing undercuts in the walls of the cup and by ribs, projections, and other irregularities inside the cup.

In order to insure clean removal of the device and prevent rupture of the mastic during removal, and also to insure stability during application, the total axial length of the device is not greater than its least diameter. Preferably the axial extension of the workable portion is made short enough, with respect to the consistency of the mastic, so that it will not break during removal.

When the device is removed, the user can reform the workable portion 13, and thus obtain a new adhesive surface. If the workable portion 13 loses its adhesiveness through accumulation of dust or other foreign particles after being used many times, the mastic may be removed with a fingernail, kneaded, and replaced in the cup, thus presenting new adhesive surfaces. If the quantity of mastic becomes depleted after many uses, a filler, such as bits of paper, may be kneaded into it to build up its volume for further greatly continued use.

Permanently pliable adhesive mastics in lump form have not heretofore been considered suitable for use as adhesive devices because they tend to flow out of the pores of the bonded surface; also they will stretch and fail in tension.

Use of permanently tacky adhesives has been limited to thin films on cellophane tape. In thick adhesive applications, mastics have been compounded with solvents or vulcanizing agents which cause the material to set and harden so as to avoid cold flow, and thus is not re-usable.

In the present invention, the combination of the cup 11, the permanently pliable mastic 12 and the projecting workable portion 13 produces unexpected results:

(1) The combination produces a stronger and more uniform bond than a piece of mastic alone. Apparently the cup serves as a hydraulic vessel, distributes the pressure throughout the mastic, and thus bonds uniformly over the entire joint area.

(2) It provides a stronger adhesive structure than a piece of mastic alone, because (*a*) the cup brings the load line close to the plane of the bond, reduces the peeling turning moment, and thus reduces tension forces normal to the plane of the bond; and because (*b*) the cup prevents the mastic from stretching and failing in tension in the direction of the load.

(3) Pressing the device into place is believed to have the effect of hardening or stiffening the mastic without actually changing it chemically as with setting mastics. This hardening or stiffening effect reduces cold flow whereby the mastic would flow out of the pores of the surface to which it is bonded.

(4) The workable portion of the mastic affords at the initial moment of application a desirable yield-ability in conforming to any irregularities of the surface to which it is applied. Also the initial flow presents fresh, tacky or adhesive surfaces and thus overcomes fingerprints which often destroy the adhesiveness of pressure sensitive materials.

(5) It requires a surprisingly small area to provide an adequate bond: much smaller, for example, than the smallest piece of adhesive tape that can be torn and handled with convenience.

(6) The relatively large mass of adhesive as compared to ordinary thin adhesive films, provides resilience against rupture due to strain and shrinkage caused by temperature changes.

(7) The combination provides a ready means for removal, and particularly means for removal by twisting which is not available in other adhesive fasteners or in a piece of mastic alone; and thus permits removal without marring or tearing the surfaces to which it has been bonded.

(8) The lateral flow of the workable portion 13 and, at re-use, the obvious and natural act of reforming the extension, provides an automatic renewal of adhesive surfaces.

Furthermore, because of the cup, fingers may be removed from the device without sticking and weakening the joint. And the combination provides a neat and tidy appearance which is not usual in adhesive applications. Together, the above advantages produce an unobvious effectiveness in this simple and inexpensive adhesive fastener.

A modification, shown in FIG. 5, has a hook 20 projecting from the cup 21 to provide a means for hanging a calendar, decoration, display merchandise, and other articles. Preferably the shank 22 of the hook is flexible in order to reduce forces perpendicular to the plane of the bond. However, other attachment devices beside hooks, such as rings, screws or cement, could be used. Mastic 12 secures the device 10′ to a wall.

In FIGS. 6 to 8, a double cup 23 is provided having mastic 12 in each end. The device 10″ can be used at the

four corners of a picture frame for mounting same on a wall.

Although the invention has been described with reference to the embodiments herein, other shapes of cups, vessels, or receptacles and other types of attachment to the device could be used without departing from the spirit of the invention so long as a cup and a yieldable adhesive mastic filling the cup and an extension of the mastic from the cup are combined.

From the foregoing disclosure it will be apparent that the present invention provides an adhesive fastener that is inexpensive, strong, neat and compact, most simple to apply and remove, applicable to hard or soft or rough or smooth surfaces, non-destructive, and re-usable almost indefinitely.

I claim:

1. An adhesive fastening device for securing articles to vertical and other surfaces comprising a cup-shaped member, a homogeneous body of tacky pliable material disposed within said cup-shaped member and having a volume greater than the capacity of said cup-shaped member, that portion of said body which projects from said cup-shaped member constituting a workable portion providing a tacky, pressure sensitive surface at room temperature for causing adhesion between said fastening device and a vertical surface.

2. An adhesive fastening device as claimed in claim 1 in which said cup-shaped member comprises a cylindrical member closed at one end and having a radially extending knurled flange projecting from the cylindrical wall thereof at the closed end for manipulative purposes.

3. An adhesive fastening device for securing articles to vertical surfaces comprising a cup-shaped member, a body of tacky pliable material disposed within said cup-shaped member and having a volume greater than the capacity of said cup-shaped member, that portion of said body which projects from said cup-shaped member constituting a workable portion providing a tacky surface for causing adhesion between said fastening device and a vertical surface, said body of tacky pliable material consisting essentially of a base substance selected from the group consisting of microcrystalline wax and polyisobutylene.

4. An adhesive fastening device as claimed in claim 3 in which said base substance includes a tackifying substance selected from the group consisting of terpene resin, cumar resin, butyl rubber and natural rubber in the amount of from ten to seventy percent by weight of said base substance.

5. An adhesive fastening device as claimed in claim 1 in which said cup-shaped member includes mechanical fastening means attached thereto.

6. An adhesive fastening device as claimed in claim 1 in which said cup-shaped member includes a hook having a flexible shank connected to a wall of said cup-shaped member and extending in a direction generally perpendicular to the axis of said cup-shaped member.

7. An adhesive fastening device for securing articles to a vertical surface comprising a cylindrical member open at both ends and having an internal wall providing two oppositely and outwardly facing cup-like recesses, a homogeneous body of tacky pliable material disposed within each of said recesses and having a volume greater than the capacity of said recesses, that portion of said body which projects from said recess constituting a workable portion providing a tacky, pressure sensitive surface at room temperature for causing adhesion between said fastening device and a vertical wall surface on the one hand, and between said fastening device and an article to be supported thereby on the other hand.

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CLAUDE A. LE ROY, *Primary Examiner.*