Oct. 31, 1939. L. W. McKEEHAN 2,177,905

HOLDER FOR THIN MATERIAL

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Fig. 1.

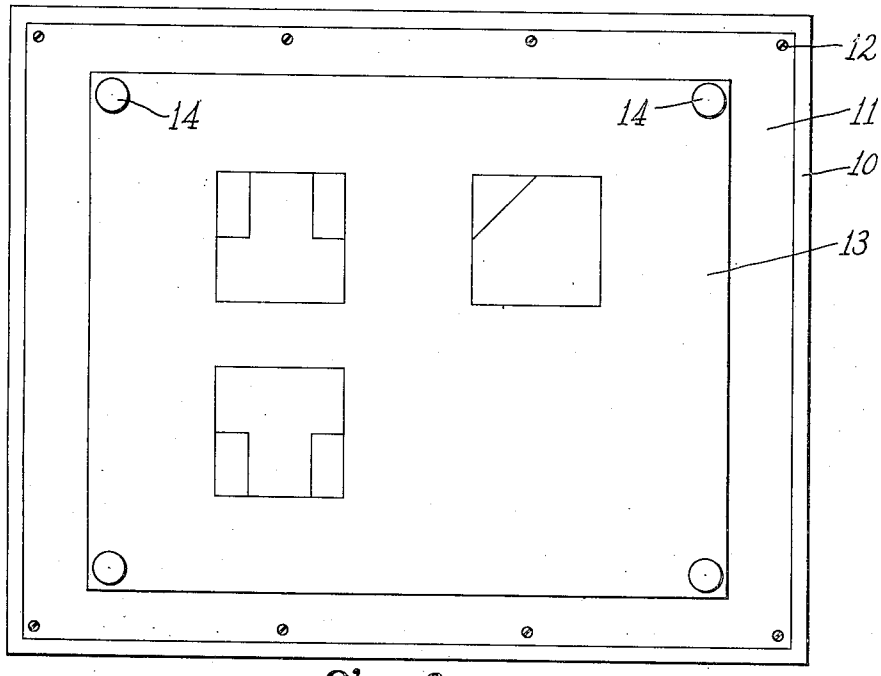


Fig. 2.

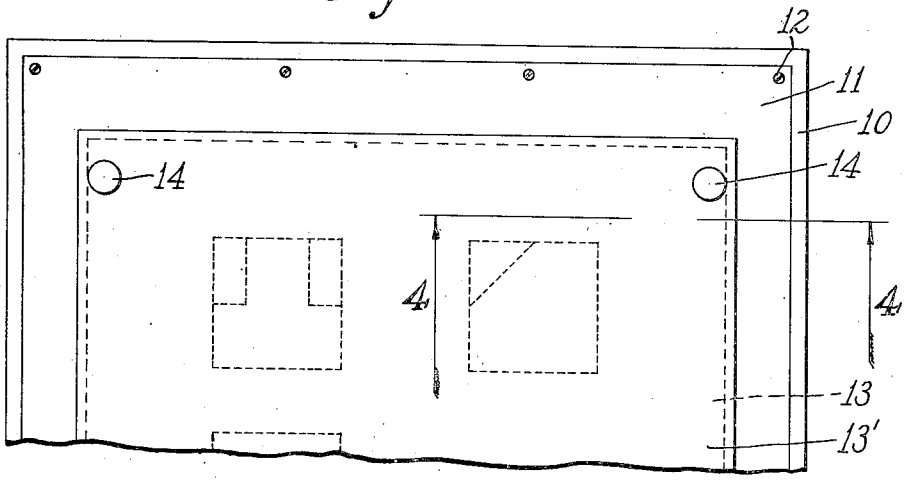
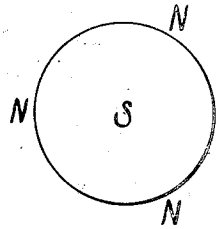


Fig. 8.



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Fig. 3.

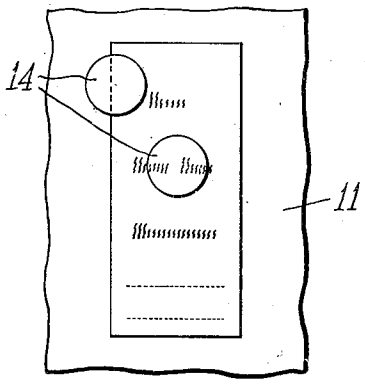


Fig. 4.

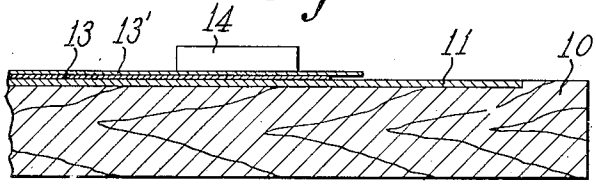


Fig. 5.

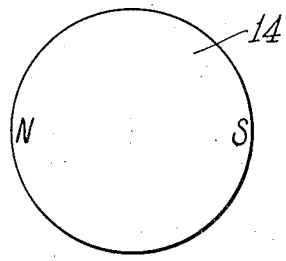


Fig. 6.

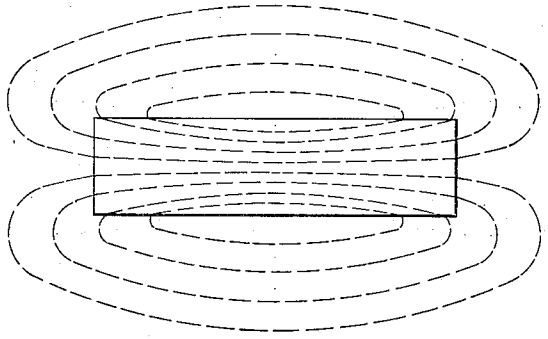
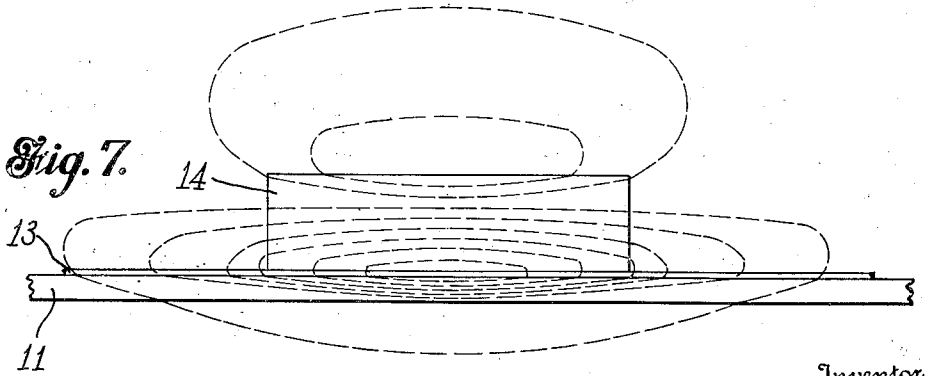


Fig. 7.



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UNITED STATES PATENT OFFICE

2,177,905

HOLDER FOR THIN MATERIAL

Louis W. McKeehan, Hamden, Conn.

Application September 24, 1938, Serial No. 231,525

5 Claims. (Cl. 45—131)

This invention relates to holders for thin material, and more particularly sheets of paper, fabric and the like. It is applicable to use in connection with holders for drawing paper, blueprints, maps, typewritten sheets, note paper, and the like, where it is desired to hold the sheet or sheets firmly in position against a supporting surface of extended area. In the present instance, the invention is illustrated as applied to a drawing board so that the drawing paper is firmly held in place on the board, but this is merely by way of example, for the invention has many other applications.

One of the objects of the invention is to provide a simple and effective device capable of being readily manipulated, whereby the sheet or sheets can be firmly clamped or held in the desired position without puncturing the sheet, the position of the sheet being variable at will and the holding point or points being readily adjustable relatively to the sheet or sheets, and relatively to the plate-like support or backing.

A further object is to provide a device of this character in which the supporting plate or backing presents a surface backing up the sheet while work, such as drawing, writing or the like, is done on the sheet.

Another object is to provide a simple and satisfactory sheet-clamping device embodying one or more small but effective permanent magnets which act very effectively for the desired purposes.

In the accompanying drawings:

Fig. 1 is a plan view of a drawing board showing one form which my improved holder may assume, illustrating the board as it appears with a partially completed drawing thereon;

Fig. 2 is a plan view of the upper part of the board showing the use of the magnets in connection with the operation of tracing a design from an underlying sheet;

Fig. 3 is a fragmentary plan view showing how a relatively small piece of paper can be held to the board by two of the small magnets;

Fig. 4 is a considerably enlarged sectional view taken on line 4—4 of Fig. 2;

Fig. 5 is a face view of one of the magnets;

Figs. 6 and 7 are side views of a magnet such as shown in Fig. 5, illustrating the disposition of the lines of force under different conditions respectively, and

Fig. 8 shows a modification of the magnet member.

My invention may assume many different embodiments, but for purposes of illustration I have shown how it is applied to a drawing board for holding drawing paper while it is being worked upon. In this embodiment the board has applied to its upper face a comparatively thin sheet of readily magnetizable material, such, for example, as rolled steel. This plate is held permanently to the face of the board in any suitable manner. In connection with the magnetizable plate, one or more small permanent magnets are used in such a manner that the plate serves as the armature for the magnets and permits the interposition between them of the sheet which is to be held in place on the board. In this particular case four of the permanent magnets are employed, but this number will vary according to circumstances. A suitable protective coating, such as chromium plate or enamel, may be applied to the magnetizable plate, the magnets, or both the plate and the magnets.

In the drawings, the body of the wooden drawing board is shown at 10, and the magnetizable plate or armature at 11. The latter is secured to the board body in any suitable manner, as, for example, by screws 12. The drawing paper to be held in place on the board is shown at 13, and the small permanent magnets at 14. In Fig. 1 these magnets 14 are shown as located near the respective corners of the paper sheet. These magnets are strongly held to member 11 by magnetic attraction, and the paper interposed between them and member 11 is firmly held in its desired position. The paper can be placed in any desired position on the backing member 11, as the magnets can be pulled away from the latter to release the sheet so that the paper can be readjusted. It is an advantage of my invention that the permanent magnets can be placed over the sheet material so as to conserve lateral space, and it is also an advantage that the magnets act with equal or substantially equal efficacy at any of the points where they are placed on the metal backing, so that the clamping or holding effect can take place at any point or points on the backing surface, as may be desired.

In order that the magnets 14 may act effectively for the purposes described, I prefer to form each of them as a relatively thick round or disk, as shown more particularly in Fig. 5. The material of which they are composed is preferably an alloy steel having the most desirable magnetic properties, here high coercive force and great stability of magnetic moment. Furthermore, I prefer that the magnetization of the disks

shall be crosswise, or, in other words, parallel to a diameter, so that the north polarity will be concentrated at one point on the periphery, and the south polarity at a diametrically opposite point, as shown in Fig. 5. This produces an important advantage in that it combines maximum magnetic strength and magnetic permanency for a given disk with a uniform clamping effect on the interposed sheet material. In referring to this uniform clamping effect, I have in mind that, regardless of which face of the disk is disposed toward the backing sheet, the same clamping effect will be had. In other words, it makes no difference which of the two faces is disposed toward the backing plate. In Fig. 8 I have shown another form of disk magnet in which a uniform clamping effect can be obtained at the two faces of the disk, one of the poles in this case being at the periphery and the other at the disk center. In this particular case the north pole is at the periphery, and the south pole at the center. However, I do not regard this form of magnet as preferable, because of the fact that, owing to the smaller distance between the poles, the de-magnetizing effect is greater and the life of the magnet correspondingly shorter.

It is not necessary that the magnets have completely plane faces, as shown in the figures. If the material to be held will not be damaged by more localized pressure, it may be advantageous to use magnets which make effective contact only over those regions where the polarity is concentrated.

In Fig. 6 I have shown in a diagrammatic manner the disposition of the lines of force relatively to the plane of the magnet when the latter is removed from the armature member. Under such conditions the magnetic fields adjacent the respective faces of the disk are substantially alike. When, however, the disk is used for holding a sheet of paper in position against the backing, as shown in Fig. 7, the magnetic field adjacent to the free face of the magnet is weakened, and the field adjacent to the other face strengthened by the concentration of its lines of magnetic flux in the metal of the backing sheet. Fig. 7, therefore, illustrates how, with a given magnetization of the disk, a relatively great holding effect on the interposed material is produced by an arrangement of fixed and movable clamping members, as described.

The sheet shown as held in Fig. 7 is non-magnetic so that the flux from the magnet passes through it substantially as it would through an equal thickness of air. If the sheet is itself magnetizable, the clamping pressure will be diminished, but may still be adequate if the sheet is so thin or so subdivided that it does not itself short-circuit too much of the flux emanating from the magnet.

The improved holder is adapted to hold more than one sheet to the backing and to each other. In Fig. 2, two sheets are shown, one of these being the sheet 13 previously mentioned, and the other being a superposed transparent sheet 13' employed for the purpose of making a tracing from sheet 13. The magnets 14 are used as before, but as shown in Fig. 2, they have somewhat different positions relatively to the paper and the drawing board. They act like thumb tacks in holding the paper to the board, but they have the great advantage that no puncturing of the paper is required. For one thing, they may be used at any point on the paper, and in close proximity to figures or the like being drawn, and their positions may be readily and quickly changed by pushing them laterally, although their holding effect in an axial direction is very considerable.

In Fig. 3 I have shown two of the magnets arranged in rather haphazard fashion on the middle portion of the board for the purpose of holding a relatively small piece of paper on which writing is to be done. Note paper or typewriter paper, etc., can also be satisfactorily held in place on a suitable backing by the use of such magnets. The device may also be used for holding blueprints while they are being examined, and for various other purposes.

The magnets will vary in thickness and in face area as called for by different conditions, and this applies to the backing sheet also. Where a number of superposed sheets are to be held in place, the holding effect of the magnets will obviously have to be greater than in the case where one or two sheets are held, and of course the character of the sheet material will have to be taken into consideration. Moreover, I do not limit myself in all aspects of the invention to the employment of disk-like magnets.

It is not at all necessary that the piece held be broad enough completely to separate the magnet from the plate. The magnets may, therefore, be used to hold down fine wires, ribbons and narrow strips of all sorts in desired positions on an extended backing.

It is understood, of course, that the magnetizable plate acting as the armature for the magnets presents a smooth upper surface, and that those parts of the surfaces of each magnet adapted to oppose the plate are smooth. Hence the plate and magnet are adapted to confine sheets of paper or the like very closely between them, with the polar regions of the magnet in the closest possible proximity to the plate. The disk, as above noted, is relatively thick, and it will be seen that it is much thicker than the plate, but obviously I do not confine myself to the relative dimensions shown in the drawings. The plate is sufficiently thick in all cases to carry the magnetic flux necessary for the effective clamping of the interposed article.

Backings which are cylinders of large radius, or other developable surfaces, may also be used in the same manner. Flat disk magnets will hold firmly against such surfaces, but it may be better to fit the magnet more exactly to the surface if high local pressures are to be avoided.

Various modifications will fall within the principles of the invention and the scope of the claims.

What I claim is:

1. A magnetic-type clamp for thin material comprising an extensive fixed member and a small movable member, the fixed member being in the form of a plate of easily magnetizable material having an extended area for backing the held material, and the movable member comprising a permanent magnet adapted to clamp the material to the backing plate at substantially any point on the backing surface by being positioned against the material held, said magnet being in the form of a flat member having a relatively large contact surface.

2. A magnetic-type clamp for thin material comprising an extensive fixed member and a small movable member, the fixed member being in the form of a plate of easily magnetizable material having an extended area for backing the held material, and the movable member comprising a permanent magnet adapted to clamp the mate-

rial to the backing plate at substantially any point on the backing surface by being positioned against the material held, said magnet being in the form of a shallow member magnetized in a crosswise direction.

3. A drawing board or the like comprising a thin plate of magnetizable material, a foundation member to one face of which said plate is applied, and a plurality of small permanent magnets of disk form and of crosswise magnetization adapted when placed over the paper sheet to clamp it in place against the plate.

4. In a holder for sheet material, the combination of a plate of magnetizable material having an extended area for backing the sheet or sheets, and a magnet of disk form adapted to clamp the sheet or sheets to the backing plate, the plate and magnet having smooth opposing surfaces between which the sheet or sheets are closely confined, and the magnet being considerably thicker than the plate, said magnet having its poles at opposite ends of a diameter.

5. A drawing board or the like comprising a thin plate of magnetizable material, a foundation member to one face of which said plate is applied, and a plurality of flat cross-magnetized magnets adapted when placed over the paper sheet to clamp it in place against the plate.

LOUIS W. McKEEHAN.