May 22, 1956 L. R. CROW 2,746,172

MAGNET HOLDING BLOCK

Filed Jan. 22, 1954 2 Sheets-Sheet 1

FIG. 1

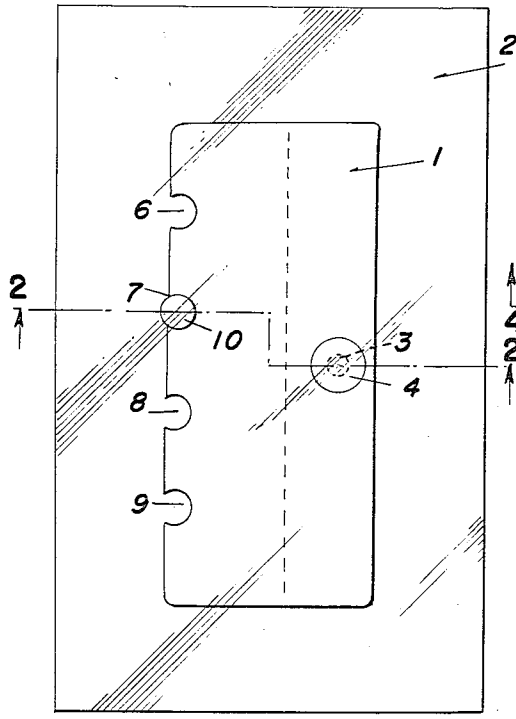


FIG. 3

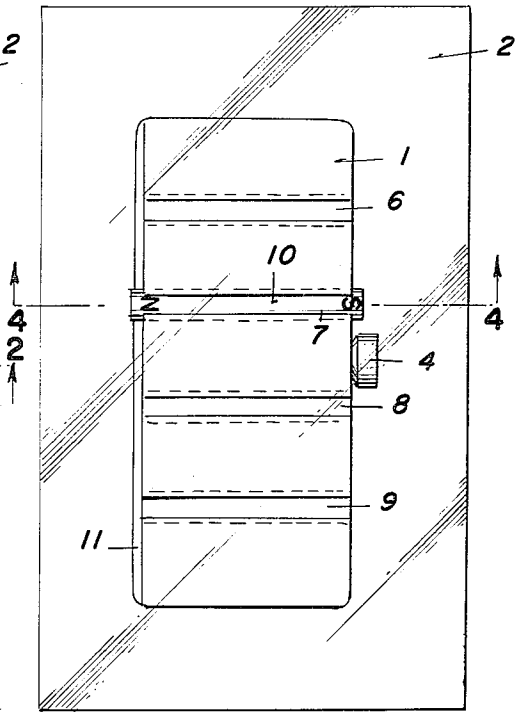


FIG. 2

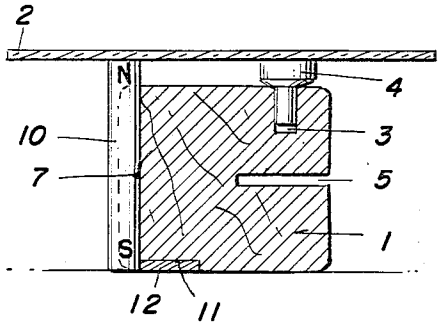


FIG. 4

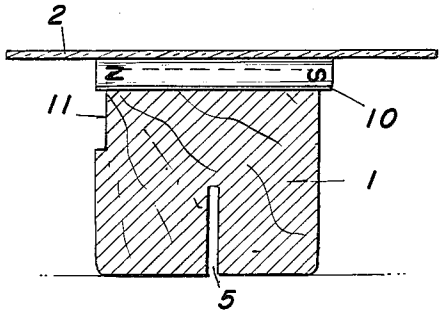
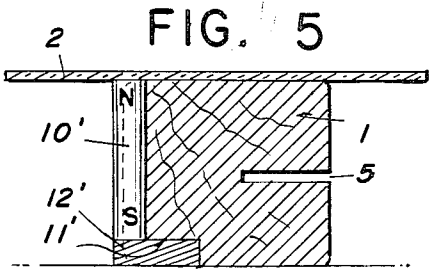


FIG. 5



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MAGNET HOLDING BLOCK

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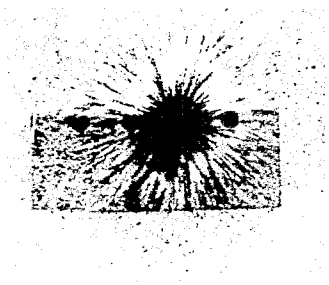

FIG. 6

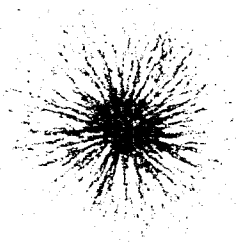

FIG. 6a

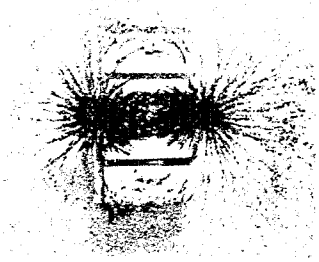

FIG. 7

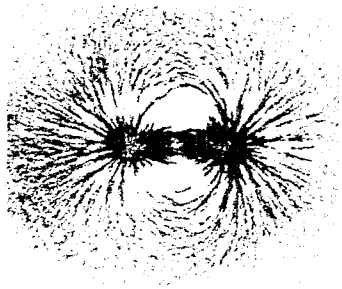

FIG. 7a

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United States Patent Office

2,746,172

Patented May 22, 1956

2,746,172

MAGNET HOLDING BLOCK

Leonard R. Crow, Vincennes, Ind.

Application January 22, 1954, Serial No. 405,632

4 Claims. (Cl. 35—19)

The present application is directed to a magnet holding block particularly adapted because of its new construction to serve as a teaching guide in the field of instruction in electricity and magnetism, whether such instruction is of the formal classroom type or home instruction from prepared lessons and experiments.

Around every magnet there is a field of invisible magnetic force. It can be proven that this field of force exists although it cannot be seen. One very effective way of proving that there is a magnetic field about a magnet is to sprinkle iron filings upon a piece of paper placed over a magnet. Sometimes it is desired to study the flux pattern of two or more magnets in combination. In this instance iron filings may be sprinkled upon a sheet of paper placed over the magnets arranged in the desired combination. The iron filings will arrange themselves to show the direction of the lines-of-force of the "field" about the magnetic poles of the magnets. Even better yet one may use a transparent sheet of plastic or glass instead of the paper and then the magnet or magnets can be partially seen through the filings and their relation to the field viewed and studied.

The magnet holding block of the present invention comprises a main body of substantially rectangular construction and may include a knob which is fitted to one of the surfaces of the body, the body being cut at one edge to form at least two substantially circular channels. The knob serves to suitably position a transparent non-conducting sheet over two or more ends of the circular magnets which are fitted in the channels. The face of the body block opposite the knob fitting is undercut along a substantial depth of said opposite face and is particularly adapted for positioning magnetic and non-magnetic strips to illustrate variations in magnetic phenomena which are due to the orientation of the cylindrical magnets in the channels.

An object of the invention is to provide an educational device consisting of a magnet holding block having at least two channels along one face thereof and a knob to hold a non-magnetic sheet against the ends of the magnets in said channels, a non-magnetic sheet material positioned by said knob to cover an end of the magnets and iron filings sprinkled over said sheet for illustrating the interaction of the magnetic lines of force from the magnets.

A further object of the invention is to provide a non-magnetic holding block provided with substantially circular channels in parallel arrangement along one face thereof and fitted with a knob to hold a transparent non-magnetic sheet over the ends of cylindrical magnets fitted in said channels, the face of the block opposite the knob being undercut for interfitting engagement of a magnetic metal or non-magnetic strip which illustrates the interaction of the magnetic lines of force through the orientation of iron filings on said sheet under the influence of the magnetic or non-magnetic strips.

Other and further objects of the present invention will appear from the more detailed description set forth below, it being understood that such detailed description is given by way of illustration and explanation only and not by way of limitation, since various changes therein may be made by those skilled in the art without departing from the scope and spirit of the present invention.

In connection with that more detailed description, there is shown in the drawings, in

Fig. 1 a top view in plane of the construction of the invention;

Fig. 2 is a view partly in section and partly in perspective along line 2—2 of Fig. 1;

Fig. 3 is a side view of the construction of the invention;

Fig. 4 a sectional view along line 4—4 of Fig. 3;

Fig. 5 a sectional view of the block in which the knob and its function are omitted;

Figs. 6, 6*a*, 7 and 7*a*, are photographic top views of iron filings used with the present construction and illustrating teaching embodiments for the study of the interaction of the magnetic field.

As is shown in Figs. 1 and 2 the magnet holding block has a main body 1 of substantially rectangular construction and a long edge is cut with at least two circular channels (6, 7, 8 and 9) each for fitting cylindrical magnet 7. The cylindrical channels, 6, 7, 8 and 9 are cut sufficiently deep so that only a small part of the circumference of the magnet extends outwardly from the channel cut surface of the block. All of the channels are substantially identical as shown in Fig. 1 so as to accommodate the same size magnet which protrudes only slightly from the edge of the block. Any number of magnets may be inserted, as desired, in the channels and if different size magnets are used, it is necessary only that the channel be modified to present the same degree of projection of the magnet regardless of its size from the edge of the block in order that the non-magnetic sheet 2 may be rested against the long edge of the magnet in substantially parallel relation to the axis of the magnet for the proper orientation of the magnetic field observed by sprinkling iron filings on said sheet.

In Figs. 1 and 2 sheet 2 rests upon knob 4 which is inserted in a hole 3 in the upper edge of the block at a point near the side opposite to the side bearing the channels. The block is undercut as shown at 11 in Fig. 2, this undercut portion adapted to accommodate a strip 12 which is suitably dimensioned so as to present its outer surface in the same plane with the bottom edge of the block and to either abut the bottom end of the magnet as shown in strip 12 in Fig. 2 or to support the bottom end of the magnet as shown in strip 12′ in Fig. 5.

In Fig. 1 sheet 2 is placed over the end of magnet 10 or as in Fig. 3 sheet 2 is placed along the length of the magnet 10. The sheet is substantially parallel to the face of the block in all of the arrangements which are shown and used for instructional purposes in order to provide for a true orientation of the magnetic field studied with respect to the axis of the magnet. In Figs. 1 and 2 the magnet 10 is of sufficient length so that sheet 2 may be rested upon knob 4 and one end of the magnet to maintain the parallel relation of the sheet to the block body 1. A median slot 5 is provided in the block body 1 as shown in Figs. 2, 4 and 5 which is adapted to detachably secure an edge of sheet 2 to position the sheet substantially perpendicularly to the face of the block which is opposite the face bearing the channels. In this arrangement the block may be turned with the channels down and the slot up and be used as a support for the vertical sheet and magnets may be arranged on opposite sides of the sheet to illustrate various features of magnetic attraction with relation to the orientation of the poles of the magnets so placed. The use of a shorter magnet 10′ as in Fig. 5 serves to eliminate knob 4 and its function and permits a comparison to be made in the study

of the effect of shunting by a magnetic strip such as **12** in abutting relationship to a pole of the magnet or in supporting relationship **12'** to a pole of the magnet.

By virtue of the detachable features of knob **4** in the hole **3** and the detachable features of strips **12** and **12'** in the undercut portions **11** and **11'** respectively as shown in Figs. 2, 4 and 5, the sheet **2** may be used in partically every possible relationship with respect to the orientation of the magnet or magnets. In Fig. 2 the sheet supports iron filings at the north pole of the magnet and the shunting effect of abutting strip **12** is illustrated. In Fig. 4 the sheet **2** can serve to illustrate the magnetic lines of force between the poles of the same magnet and this can be further studied for the effect of an additional magnet which is placed in the next channel, two channels away, three channels away or at any distance as desired. The poles may be in the same direction or reversed as to direction as between adjacent magnets. Any number of magnets may be used to determine the behavior of these lines of force.

The flexibility and remarkable adaptability of the magnet block holder for instructional purposes is well pointed out in Figs. 6–7*a* inclusive.

In Fig. 6 the wood block is laid on its side in the manner shown in Fig. 1.

One permanent magnet is placed in the block, and the wood peg is put into place to hold the flexible sheet level. The flexible sheet may be transparent (glass or plastic) or opaque (paper).

Iron filings are sprinkled on the surface of a glass plate directly above the end of the magnet pole, and the magnetic field pattern observed is shown in Fig. 6.

The glass plate is carefully removed, care being taken not to a sprinkle or drop any of the iron filings on the end of the magnet because filings cling very tenaciously to a magnet and much trouble and patience are required to remove them. A piece of thin white cardboard is substituted for the glass plate, the iron filings are poured by hand and sprinkled onto the cardboard directly above the end of the magnet pole. The field pattern is shown in Fig. 6*a*.

In making the flux pattern of Fig. 6 the iron filings were carelessly sprinkled above the magnet pole. This shows the effect of careless preparation in carrying out the experiment. Such demonstration is valuable in teaching the student to always be careful in preparing an experiment. Fig. 6*a* shows how the flux pattern of Fig. 6 would have looked had care been exercised in sprinkling the filings.

In Figs. 7 and 7*a* there are shown the flux patterns of the two poles of a permanent magnet.

One permanent magnet is placed in the face of the wood block with the face of the block up as shown in Fig. 3. Then a glass plate **2** is placed over the magnet as in Fig. 3, and iron filings are carefully sprinkled on the glass over the magnet. The magnets are carefully placed in the wood block so that their adjacent poles are not alike. The resulting flux pattern is shown in Fig. 7. The glass plate is removed and the white thin cardboard substituted therefor. Filings are sprinkled on the cardboard and the resulting flux pattern is shown in Fig. 7*a*.

The foregoing description of the photographs illustrate clearly how the present device is used for classroom or home instructions. Not all of the possible positions of the magnet are shown hereinabove. Others as will be obvious from manipulation and inspection are possible.

Further, the distances between the channels are illustrative only and may be varied only as desired with respect to the field strength and configuration of the magnets used.

The sheet material may be transparent, translucent or opaque as long as it is non-magnetic, i. e. as long as it does not substantially affect the flux lines. The block is conveniently made of wood but may also just as conveniently be formed by molding such as injection molding from a suitable plastic material, or it may be formed from any other non-magnetic substance.

Accordingly, the foregoing provides a novel and useful educational arrangement for aiding the instruction of students in the study of electricity and magnetism, particularly in a study of the static effects of magnetic fields.

It is thought that the invention and its advantages will be understood from the foregoing description and it is apparent that various changes may be made in the form, construction and arrangement of the parts without departing from the spirit and scope of the invention or sacrificing its material advantages, the forms hereinbefore described and illustrated in the drawings being merely preferred embodiments thereof.

Having thus disclosed the invention what is claimed is:

1. An educational device consisting of a magnet holding block having at least two magnet holding channels in parallel spaced relation along one face thereof, said block adapted to support a non-magnetic sheet against the ends of magnets placed in said channels, and the other face of the block adjoining the face having the channels being undercut for interfitting engagement of a magnetic metal strip or non-magnetic strip which illustrates the interaction of the magnetic lines of force through the orientation of iron filings on said sheet.

2. An educational device consisting of a magnet holding block having at least two channels along one face thereof and a knob to support a non-magnetic sheet level with the ends of magnets placed in said channels, a non-magnetic sheet material supported by said knob to cover the ends of the magnets and iron filings sprinkled over said sheet for illustrating the interaction of the magnetic lines of force from the magnets.

3. A non-magnetic holding block provided with substantially circular channels in parallel arrangement along one face thereof and fitted with a knob to support a transparent non-magnetic sheet level with the ends of cylindrical magnets fitted in said channels, the face of the block opposite the knob being undercut for interfitting engagement of a magnetic metal or non-magnetic strip which illustrates the interaction of the magnetic lines of force through the orientation of iron filings on said sheet under the influence of the magnetic or non-magnetic strip.

4. An educational device consisting of a magnet holding block having at least two substantially circular channels in parallel relationship along one face thereof and having a median undercut along a substantial depth of the face opposite to the face of the block which has said channels therein, magnets inserted in said channels with a small portion of their periphery projecting above the face of said block, a non-magnetic sheet which rests on said block against the ends of the magnets in said channels, and iron filings sprinkled over said sheet for illustrating the interaction of the magnetic lines of force from the magnets, said undercut portion serving to support a non-magnetic sheet in substantially perpendicular relation to said block for the illustration of magnetic phenomena on opposite sides of said sheet.

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