Jan. 5, 1943. E. S. SAVAGE 2,307,424

PAPER CUTTING DEVICE

Filed July 29, 1941

Fig. 1.

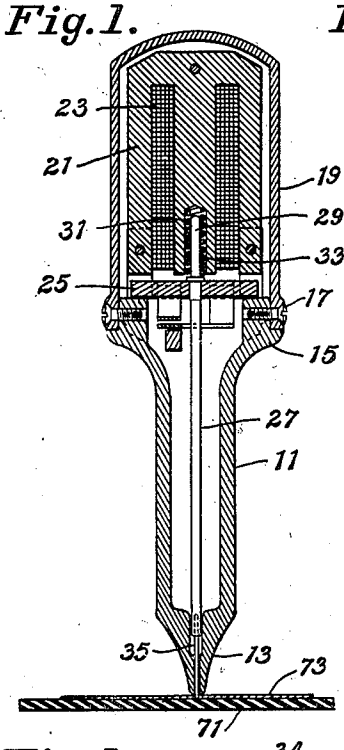


Fig. 2.

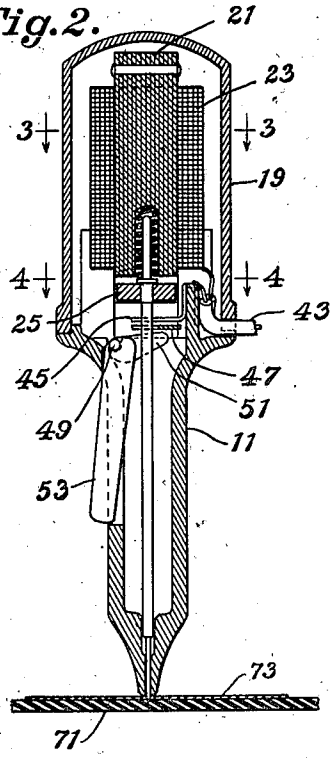


Fig. 3.

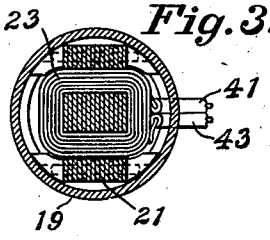


Fig. 4.

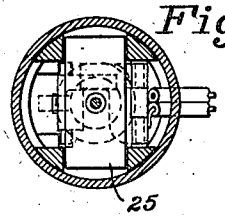


Fig. 5.

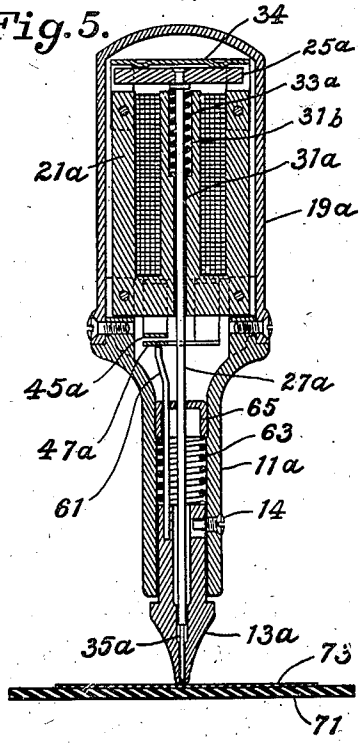
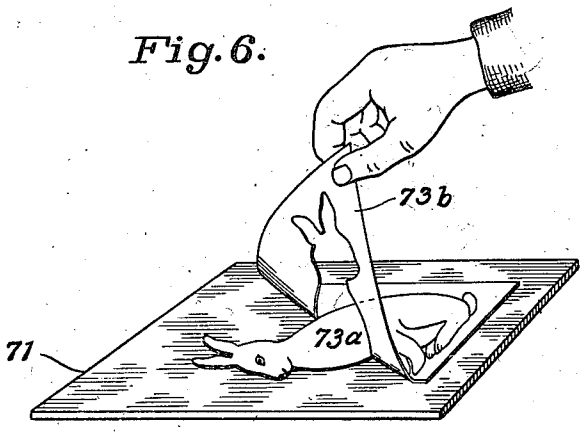


Fig. 6.



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PAPER CUTTING DEVICE

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Application July 29, 1941, Serial No. 404,482

4 Claims. (Cl. 30—272)

This invention relates to a paper cutting device.

An object of the invention is the provision of an improved and more satisfactory device whereby figures, lacework, or other designs may be cut from paper in a minimum of time and in such a way that the figure or design cut from the sheet may be separated from the remainder of the sheet quickly and easily.

Another object is the provision of a generally improved and more satisfactory cutting device, which can be constructed easily and cheaply, and which is sturdy in use.

Still another object is the provision of a cutting device so constructed that it may be used satisfactorily and safely by children.

A further object is the provision of a cutting device in combination with a base or mat so constructed that when a sheet of paper to be cut is interposed between the cutting device and the mat, a cut is produced in such a way as to facilitate the separation of the cut parts of the paper.

To these and other ends the invention resides in certain improvements and combinations of parts, all as will be hereinafter more fully described, the novel features being pointed out in the claims at the end of the specification.

In the drawing:

Fig. 1 is a vertical section taken centrally through a device in accordance with a preferred embodiment of the invention;

Fig. 2 is a similar vertical section through the same device, taken on a plane at right angles to the plane of Fig. 1;

Fig. 3 is a horizontal cross section substantially on the line 3—3 of Fig. 2;

Fig. 4 is a horizontal cross section substantially on the line 4—4 of Fig. 2;

Fig. 5 is a view similar to Fig. 1 showing a modified form of construction, and

Fig. 6 is a perspective view showing the step of separating the cut parts of the sheet, after the completion of the cutting operation.

The same reference numerals throughout the several views indicate the same parts.

The cutting device of the present invention operates electromagnetically, and is supplied with alternating electric current of conventional kind (for example, house lighting current, such as current at 110 volts, 60 cycles) through a flexible cord or wire. The device itself, in its preferred form (Figs. 1 to 4) includes an elongated casing having a tubular portion 11 of a size conveniently grasped by the fingers, this portion forming the handle by which the device is held and manipulated. The lower end of the tubular portion 11 is tapered as at 13 to a relatively blunt point, while the upper end is flared at 15 and is fastened, as by screws 17, to an upper tubular portion 19 of larger diameter than the handle portion 11, and closed at its upper end.

Within the portion 19 is an electromagnet, the core of which is indicated at 21 and the coils at 23. An armature 25 located beneath the magnet is mounted for vertical movement toward and away from the bottom of the magnet 21. This armature is fixed to a rod 27, the upper end 29 of which extends into a bore or cavity 31 in the magnet 21, and a coiled spring 33, also in the cavity, surrounds the upper end 29 of the rod and tends to push the rod and the armature 25 downwardly, also serving as a guide for the rod.

When alternating current flows through the winding 23, each current impulse magnetizes or energizes the magnet 21 and causes it to attract the armature 25, moving it upwardly against the force of the spring 33. During those portions of the alternating current cycle when current is not flowing through the coil, the magnet is de-energized and the spring 33 pushes the armature 25 and the rod 27 downwardly. The result is a very rapid upward and downward vibration of the armature and rod, when the magnet coil is connected to a conventional source of alternating current.

The tapered tip 13 of the casing 11 has a longitudinal bore therethrough, opening substantially at the center of the blunt pointed end or tip of the casing. The lower end of the rod 27 is guided in this bore. A needle-like member 35 integral with or securely fastened to the rod 27 extends through the bore and terminates in a sharp needle point which projects slightly beyond the lower end of the tip 13 when the armature 25 and rod 27 are in their lowest positions, and which is withdrawn substantially entirely within the bore when they are in their highest positions. The tip 13 forms a bearing holding the rod 27 and the needle 35 against lateral deflection while permitting longitudinal movement. The lower end of the tip 13 is slightly rounded as indicated in the drawing to glide easily over the paper, and is of quite small diameter so as not to interfere with vision of the figure being cut, and so as to serve as a pointer to be drawn along a desired line of the figure, to produce a cut along this line.

The wires for supplying current to the magnet enter the casing, as indicated at 41 and 43, one wire going direct to the winding 23 and the other going to a switch having separable contact members 45 and 47 resiliently tending to spring apart

to open the switch. A two-armed lever is pivoted in the casing at 49, in such position that one arm 51 underlies the switch member 47, and the other arm 53 extends longitudinally of the tubular handle 11 and projects through a longitudinal slot therein. When the fingers are placed around the handle 11 to grasp the device, the pressure of the fingers normally moves the lower end of the lever 53 radially inwardly with respect to the tubular casing, swinging the lever about the pivot 49 to raise the arm 51 to bring the switch parts 45 and 47 into contact with each other, to close the switch and start the device in operation. When the user lets go of the handle portion 11, the arm 53 is free to swing radially outwardly, and the switch automatically opens.

An alternative construction is illustrated in Fig. 5, in which the casing parts 11*a* and 19*a* may be substantially the same as the parts 11 and 19 previously described, except that the tapered tip 13*a*, instead of being formed integrally with the tubular part 11*a*, is a separate member slidable longitudinally in the portion 11*a*, the extent of movement being limited by a screw 14 threaded into the tubular casing portion 11*a* and projecting into a slot in the portion 13*a*. The magnet and armature may be the same as described in connection with Figs. 1 to 4, or may be reversed end for end as here shown, the magnet core 21*a* having a longitudinal bore 31*a* extending completely through from end to end and having an enlargement 31*b* near its upper end, in which a compression spring 33*a* is seated. The armature 25*a* is here placed above the magnet rather than below, but is connected, as before, to the rod 27*a*. The spring 33*a* pushes upwardly on the rod and the armature and tends to raise them relatively to the magnet, to a height limited by contact with a fixed stop 34. Each time that the magnet is energized during flow of alternating current the armature 25*a* will be attracted downwardly toward the top of the magnet and will carry the rod 27*a* downwardly, depressing the needle 35*a* at the lower end of the rod. Each time that the magnet is de-energized during the current cycle, the spring 33*a* will raise the armature and the rod, retracting the needle. As in the construction first described, the result is a rapid upward and downward vibration of the armature and the needle.

One of the current supply wires (not shown) passes, as before, to a switch including the separable members 45*a* and 47*a*. A rod 61 has its lower end fixed in the longitudinally slidable tip 13*a* and has its upper end underlying the switch member 47*a*. A coiled compression spring 63 reacts at its lower end against the movable tip 13*a* to tend to move it downwardly, and at its upper end against a stop member 65 fixed in the tubular portion 11*a*. With this switch construction, the placing of the fingers around the tubular handle portion 11*a* to grasp the device does not, in itself, close the switch, but the switch is closed when downward pressure is exerted on the device to force the tip 13*a* firmly against the sheet of paper to be cut. This pressure causes the tip 13*a* to rise relatively to the tubular portion 11*a*, which thrusts the upper end of the rod 61 against the bottom of the movable switch member 47*a*, raising this switch member into contact with the switch member 45*a* to close the switch and start operation of the device. When the downward pressure on the device is relieved, the switch is automatically opened and operation is stopped. The length of the members 27*a* and 35*a* are such, with regard to the range of movement of the tip 13*a* in the casing 11*a*, that when the tip 13*a* is thrust to its uppermost position, the sharp end of the needle 35*a* is in the same relation to the tip as in the embodiment previously described.

Either form of switch may be used with either form of magnet assembly. That is, the lever form of switch indicated in Figs. 1 to 4 may be used with a magnet assembly in which the armature is below the magnet, as there shown, or in which the armature is above the magnet as in Fig. 5. Similarly, the longitudinal-pressure-actuated form of switch shown in Fig. 5 may be used with a magnet assembly in which the armature is placed below the magnet as in Figs. 1 to 4, equally as well as with one in which the armature is placed above the magnet. The switch construction of Figs. 1 to 4 is ordinarily preferable to the switch construction shown in Fig. 5, while the magnet assembly construction shown in Figs. 1 to 4 is also ordinarily preferable to the magnet assembly construction shown in Fig. 5, for which reason this switch construction and this magnet assembly construction are illustrated together, although not necessarily so used, as above pointed out

In the magnet assembly construction shown in Figs. 1 to 4, the downward or effective stroke of the needle is caused by the spring rather than by the attraction of the magnet, and the attraction of the magnet serves to pull the needle back ready for its next stroke. In the alternative construction shown in Fig. 5, the downward or effective stroke of the needle is caused by the attraction of the magnet, and the spring serves to retract the needle to position it ready for the next stroke. Either construction is found to give sufficient paper-penetrating power for normal use.

Both forms of construction above described are preferably used in combination with a base or mat 71 of resilient material, preferably in the form of a sheet of resilient rubber, although rubber composition, cork composition, etc., may be used. The sheet of paper to be cut is placed on top of the mat 71, as indicated at 73. The cutting device, which is portable and entirely self-contained except for the supply of current through the flexible wires, is grasped in the hand and the blunt pointed tip 13 or 13*a* is brought into contact with the paper at the point where the cut is to be begun. The switch is closed, either by grasping the lever 53 or by downward pressure upon the entire device, as the case may be. The device is then moved laterally over the paper, keeping the end of the tip 13 or 13*a* in contact with the paper so as to ride or slide thereover along the intended line of cut. The slow lateral movement of the needle, in conjunction with its rapid longitudinal vibrations, produces a series of tiny holes in the paper, spaced so closely together as to form in effect substantially a single continuous cut.

Moreover, the use of the resilient mat in combination with this cutting device has the important property that the downward movements of the needle cause it not only to penetrate through the sheet of paper being cut but also to enter an appreciable distance into the resilient mat at each stroke. It is found in practice that this action causes shreds or particles of the paper to enter and remain in the tiny holes in the resilient mat which are caused by the strokes of the needle. These shreds or particles remain in the holes when the needle is withdrawn, thus anchoring the paper to the mat. Then if the portion of the paper on one side of the cut is

lifted from the mat (tearing or pulling out the shreds of this piece of paper which have anchored it to the mat) the shreds of the other piece of paper on the other side of the cut line will usually remain in anchored relation to the mat, so that the two parts of the paper sheet are thus readily separated from each other. This is graphically illustrated in Fig. 6 of the drawing, which shows the mat 71 and the sheet of paper 73 which has been cut around the outline of the figure 73*a*, leaving a remnant 73*b*. Upon grasping the corner of the remnant 73*b* of the sheet and lifting it as illustrated in the drawing, it readily tears loose from the mat and from the portion 73*a* which remains anchored to the resilient mat 71 for the time being. After the remnant 73*b* is completely removed from the mat, the cut out figure 73*a* may be removed by grasping it at a convenient point and lifting it upwardly. This easy separation of the cut pieces of paper from each other avoids the necessity of the tedious and time-consuming operation of separating the pieces of paper from each other along the cut line by hand, inch by inch, as would frequently be necessary if the resilient mat were not employed.

A noteworthy feature of the cutting device of the present invention is the fact that the needle 35 or 35*a*, when in its extreme outermost position, projects only slightly beyond the blunt end of the tip 13 or 13*a*, so that in use the blunt end of the tip remains in contact with the paper and serves as a guard for the needle as well as a guide point useful in controlling the progress of the lateral movement of the cutting device over the sheet along the desired line. This feature of the small extent of projection of the needle serves also to increase the safety of the device so that it may be used without substantial danger by children. In fact, while the device and method of the present invention are useful to adults in cutting out paper, lacework, wall paper designs, etc., yet it is believed that the device and method are of greatest usefulness and appeal to children for cutting out paper dolls, cartoon characters, or other figures. The device is particularly adapted to easy cutting of openings surrounded by unbroken material, such as the openings within the outlines of the alphabetical letters A, D, and O, which are difficult for a child to cut with scissors or shears.

The term "figure" as used here and in the accompanying claims with reference to the paper being cut, is intended to be interpreted in a broad sense as including, broadly, not only animal and human figures, but also regular or irregular geometrical figures, letters of the alphabet, scenes, and other designs of any character which it may be desired to cut out.

Although the device has been referred to as a paper cutter, it may be used not only for cutting what is strictly and technically paper, but also for cutting certain types of fabric, metal foil, transparent sheeting such as "Cellophane," etc., and all of such materials are intended to be included in the broad term "paper" as used in this specification and in the accompanying claims.

The cutting point has been referred to as a needle point, this being the preferred form of construction, but it will be understood that it could be a small chisel point, especially when the material to be cut is fabric. The expression "cutting member," as herein used, is intended to cover generically both a needle pointed member and a chisel pointed member.

While certain embodiments of the invention have been disclosed, it is to be understood that the inventive idea may be carried out in a number of ways. This application is therefore not to be limited to the precise details described, but is intended to cover all variations and modifications thereof falling within the scope of the appended claims.

I claim:

1. The combination with a portable paper cutting device comprising a cutting member and means for rapidly reciprocating said member to cut the paper, of a paper supporting mat made of resilient material into which said member penetrates and carries projecting portions of cut edges of the paper, said mat operating by expansion after such penetration of the cutting member to grip said paper edge portions and yieldably retain the cut portions of the paper on the mat surface for removal separately from each other.

2. The combination with a portable paper cutting device comprising a cutting member and means for rapidly reciprocating said member to cut the paper, of a paper supporting mat made of rubber material into which said member penetrates.

3. The combination with a portable paper cutting device comprising a casing having a tapered end terminating in a blunt point, a bore extending through said casing and said point, a cutting member reciprocating longitudinally in said bore, and means within said casing for rapidly reciprocating said member through said casing point for cutting a sheet of paper against which said point is placed, of a paper supporting mat made of resilient material into which said member penetrates and carries projecting edge portions of said paper, said mat operating by expansion after such penetration to grip said paper edge portions and retain the cut paper portions for removal separately from said mat.

4. The combination with a portable paper cutting device comprising a casing having a tapered end terminating in a tracing point, a bore extending through said casing and point, a cutting member reciprocating longitudinally in said bore and means for rapidly reciprocating said member to alternately project its cutting end a predetermined distance beyond said point and retract the same therewithin, for cutting a sheet of paper along lines traced by said point, of a paper supporting mat made of rubber material into which said cutting member penetrates.

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