Aug. 17, 1954 P. C. HUTTON 2,686,495

ERASER

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FIG. 1.

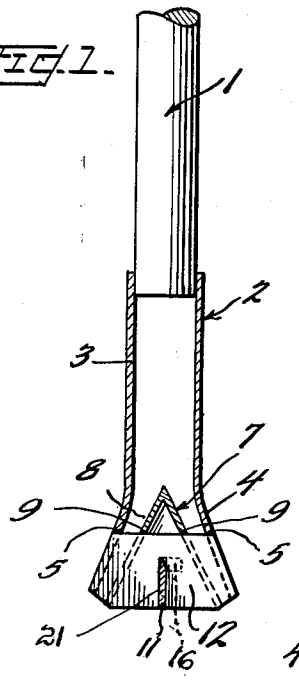


FIG. 2.

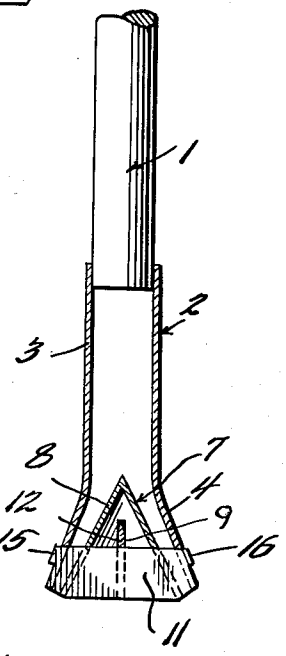


FIG. 4.

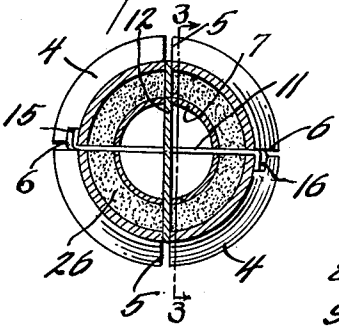


FIG. 3.

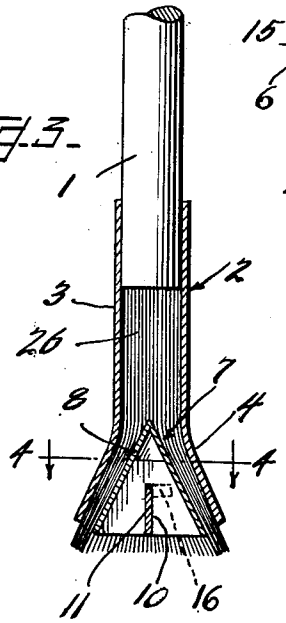
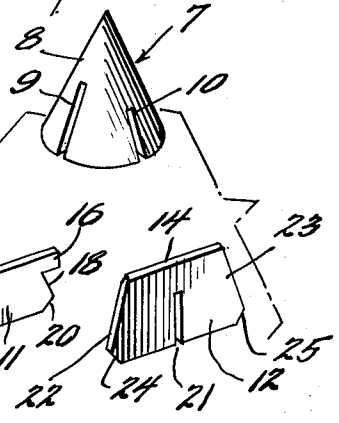


FIG. 5.



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ERASER

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9 Claims. (Cl. 120—36)

1

My present invention relates to erasers, and has particular reference to an eraser comprising an erasing element composed of a bundle of relatively stiff, abrasive filaments such as wire of fine denier, spun glass or the like. While the novel eraser of my present invention is particularly adapted for use as the erasing or abrading element of a pneumatically driven erasing machine, it is to be understood that its use is not so limited, and that this eraser is capable of use with power driven erasers of any desired or preferred construction, and that this eraser may also be used as a hand actuated or operated eraser.

It is an object of my present invention to provide an eraser composed of a bundle of relatively stiff abrasive filaments, and to provide a novel holder for such filaments which will function as a means for enclosing and retaining the bundle of filaments and for projecting one end of said bundle beyond the end of the holder to constitute the erasing surface.

It is a further object of my present invention to provide an eraser composed of a bundle of relatively stiff abrasive filaments, and to provide a novel holder for such filaments which will function as a means for enclosing and retaining the bundle of filaments and for projecting one end of said bundle beyond the end of the holder to constitute an erasing surface of annular configuration.

It is a further object of my present invention to provide a novel holder for a bundle of relatively stiff abrasive filaments, which holder preferably has an outwardly-flared or frusto-conical end portion within which is positioned a substantially conical spreader member, the configuration of the end portion of the holder and of said conical spreader member serving to spread one end of the bundle of filaments into an annular erasing surface which, when moved lightly over the surface of paper, parchment or the like, will readily erase or remove from such surface pencil, ink, paint or pigment lines or markings appearing on the surface of such paper, parchment or the like.

It is a further object of my present invention to provide a novel holder for a bundle of relatively stiff abrasive filaments, which holder includes a tubular portion which terminates at one end in an outwardly-flared or frusto-conical portion, and to provide a substantially conical spreader member within the said outwardly-flared or frusto-conical portion, the bundle of filaments being enclosed and retained within the holder, and means being provided to force said bundle outwardly of the tubular holder through the outwardly-flared or frusto-conical end portion thereof and beyond the conical spreader member, whereby the bundle of filaments is spread outwardly to form an annular erasing surface of a diameter exceeding that of the unspread bundle of filaments, the arrangement being such that the end of said erasing surface is disposed at an angle such as to be substantially parallel to the surface to be erased when the said holder is disposed at an angle to such surface.

2

It is a still further object of my present invention to provide an eraser holder of the above referred to character which includes a novel means for mounting and retaining the conical spreader member within the outwardly-flared or frusto-conical end of the holder, and to provide an eraser of the character above referred to which is strong and durable, relatively cheap and easy to manufacture and assemble, and which is highly efficient in the purposes for which designed.

In the accompanying drawings wherein for the purpose of illustration is shown a preferred embodiment of my present invention:

Figure 1 is a fragmentary, part elevational and part sectional view of an eraser holder constructed in accordance with my present invention;

Figure 2 is a view similar to Figure 1 showing the eraser holder turned ninety degrees from the position shown in Figure 1;

Figure 3 is a view similar to Figure 1 showing a bundle of filaments of wire of fine denier, spun glass, or the like within the holder and with the lower portion of said bundle spread or flared outwardly and terminating beyond the flared end of the holder to form an annular erasing surface, this view being taken on the line 3—3 of Figure 4;

Figure 4 is an enlarged, transverse sectional view on the line 4—4 of Figure 3, and

Figure 5 is an exploded view showing, in perspective, the conical spreader member and the preferred means for retaining the same in position within the outwardly-flared or frusto-conical end portion of the holder.

In the accompanying drawings, wherein like reference numerals have been employed to designate like parts throughout the several views, the numeral 1 designates a shaft preferably of circular transverse cross section. This shaft 1 may be of a diameter approximating that of an average size pen-holder or pencil. If the eraser of my present invention is to be employed as the erasing element of a pneumatically, electrically, or mechanically driven erasing machine, the shaft 1 is suitably connected to the driving mechanism of such machine in a manner such as to be rotated about its axis, preferably at a relatively high speed, as is customary in the operation of such machines.

The improved and novel eraser holder of my present invention comprises a tubular element 2 of an internal diameter such as to tightly engage the end portion of the shaft 1 when said shaft is slidably engaged within said tubular element. By virtue of the relatively tight fit existing between the inner surface or bore of tubular

element 2 and the outer surface of shaft 1, the said tubular element 2 is frictionally retained on the shaft 1 and is caused to rotate therewith. While the tight fit existing between the shaft 1 and the tubular element 2 is such as to constrain these two members for simultaneous rotation, it is possible, upon the exertion of a reasonable amount of manual force, to slide the element 2 axially of the shaft 1 for a purpose to be hereinafter described. If desired, the external configuration of the shaft 1 and the internal configuration of the bore of the tubular element 2 may be of square, rectangular, or of other non-circular form in transverse cross section, whereby rotation of the shaft 1 will positively effect simultaneous rotation of the tubular element 2 without the possibility of slippage. In other words, the engagement between the shaft 1 and the tubular element 2 may take any desired or preferred form, it merely being necessary that the engagement be such as to insure simultaneous rotation of the two parts while permitting axial movement of one part with respect to the other.

The tubular element 2 of my present invention includes a cylindrical portion 3 which terminates at one end in an outwardly-flared or frusto-conical portion 4 having pairs of diametrically-opposite, axially-extending slots 5 and 6 therein, the pair of slots 5 being somewhat longer than the pair of slots 6. Preferably the plane coinciding with slots 5 is at right angles to the plane coinciding with slots 6, as best shown in Fig. 4 of the accompanying drawings.

A spreader member 7 is secured within the outwardly-flared or frusto-conical portion 4 of the holder, and comprises a conical member 8 having pairs of diametrically-opposite, axially-extending slots 9 and 10 therein, the pairs of slots 9 being somewhat longer than the pair of slots 10 as best shown in Figure 5 of the accompanying drawings. The lengths and angular dispositions of the slots 9 and 10 correspond to the lengths and angular dispositions of slots 5 and 6, respectively. It is to be particularly noted that the sides of the conical spreader member 7 are formed at a greater angle to the longitudinal axis of the tubular element 2 than are the sides of the outwardly-flared or frusto-conical portion 4 of tubular element 2. When the conical spreader member 7 is disposed within the portion 4, the outer surface of said spreader member is disposed and maintained in spaced relation with respect to the inner surface of portion 4, the spacing between the upper or apex portion of said spreader and the adjacent inner wall of portion 4 being greater than that between the lower portion or base of said conical spreader member and the adjacent inner surface of portion 4, all as clearly shown in Figures 1, 2 and 3 of the accompanying drawings. Preferably, the total area of the annular space between the lower portion or base of the conical spreader member 7 and the lower end of the outwardly-flared or frusto-conical portion 4 is substantially equal to the area of the bore of cylindrical portion 3 of tubular element 2, for a purpose to be hereinafter described.

As a means for rigidly securing the conical spreader member 7 within the outwardly-flared or frusto-conical portion 4 of the holder, I provide two relatively thin, flat joining strips 11 and 12, the upper edges of which strips are sharpened or bevelled as indicated at 13 and 14. Strip 11 is provided at its opposite, upper corners with bendable tabs or projections 15 and 16 beneath which are outwardly and downwardly inclined end walls 17 and 18 each formed on an angle corresponding to the angle of the outer surface of frusto-conical portion 4 of the holder. The end walls of strip 11 terminate at their lower portions in inwardly and downwardly inclined wall portions 19 and 20. Strip 12 is provided with an open-ended vertical slot 21 which extends upwardly from the lower edge of said strip toward the top edge thereof at about the mid-portion of said strip, the length of this slot corresponding to the height of the strip 11 and being of a width slightly less than the thickness of said strip 11, the strips 11 and 12 each being of a thickness slightly greater than the width of the slots 5 and 6 in the outwardly-flared or frusto-conical portion 4 of the holder 2, and of a thickness slightly greater than the width of the slots 9 and 10 in the conical spreader member 7. The end walls 22 and 23 of strip 12 incline downwardly at an angle corresponding to the angle of the portion 4 of the holder 2, these end walls terminating in inwardly and downwardly inclined portions 24 and 25.

Having thus described the construction of a preferred form of filament holder forming part of my present invention, I will now describe the manner of assembling and using the same. The first step of assembly consists in forcing or tapping the strip 11 into the slot 21 in strip 12 so that the strip 11 is firmly and securely held within the said slot with the said strips forming a cruciform structure. The cruciform structure thus formed is then forced or tapped into the slots 9 and 10 of the conical spreader member 7, strip 12 entering slots 9 and strip 11 entering slots 10, the outer end portions of said strips projecting outwardly an appreciable distance beyond the outer surface of said conical member 7. The conical member 7 and strips 11 and 12, assembled as described, are now moved to a position within the outwardly-flared or frusto-conical portion 4 of the holder, the end portions of strip 12 are forced or tapped into slots 5, and the end portions of strip 11 are forced or tapped into slots 6 with the tabs or projections 15 and 16 projecting outwardly beyond the outer surface of portion 4 of the holder 2. The tabs or projecting portions 15 and 16 are then bent at right angles to the plane of strip 11 and thus overlie and engage the outer surface of the portion 4. Since these tabs or projections 15 and 16 are positioned intermediate the length of the inclined outer surface of portion 4, they effectively prevent the strips 11 and 12 and the conical spreader member 7, to which they are rigidly secured, from moving outwardly of the holder. This assembly operation positions the conical spreader member 7 within the holder with the apex of said member located on the axis of the tubular portion 3 of the holder, and with the outer surface of the said spreader member maintained in proper spaced relation with respect to the inner surface of portion 4, all as clearly shown in the accompanying drawings.

A cylindrical bundle 26 of wire of fine denier, spun glass or like straight and relatively stiff abrasive filaments is then inserted axially into the bore of tubular portion 3 of the holder through the upper, open end thereof. The holder with the filaments therein is then placed over the end of shaft 1 and is moved axially of said shaft. During this relative axial movement, the end of the shaft 1 within the holder acts as

a piston or ram to force the lower end of the bundle of filaments against the apex of the conical spreader member 7 and through the downwardly converging space between the outer surface of the said member 7 and the inner surface of portion 4 of the holder. This relative axial movement between the holder and shaft is continued until the ends of the filaments project beyond the end of the holder and thus form an eraser of annular configuration with the outermost edge or bottom surface of such eraser inclined at an angle which will enable said edge or bottom surface to be substantially parallel to the surface to be erased when the shaft and holder are inclined with respect to the surface to be erased, i. e., when the shaft, holder and eraser are held at an inclination corresponding substantially to that at which a pen or pencil is usually held when writing on a flat surface. It is to be noted that when the bundle of filaments 26 is being moved axially toward the outwardly-flared or frusto-conical end portion 4, the lower end of said bundle is forced into contact with the tip or apex of the conical spreader member 7. Continued downward movement of the bundle 26 moves the lower end of the said bundle along the downwardly converging annular space between the outer surface of the spreader member 7 and the inner surface of portion 4. During such downward movement, the descending and outwardly-flared lower end of bundle 26 will contact the upper sharpened or bevelled edges 13 and 14 of strips 11 and 12, respectively, such contact serving to divide the said lower portion of the bundle into four substantially equal parts. Obviously, this division of the bundle and the engagement of appreciable lengths of the filaments with the sides of the members 11 and 12, will serve to prevent axial rotation of the said bundle within the holder, and will effect axial rotation of the bundle of filaments simultaneously with axial rotation of said holder when shaft 1 is rotated. Due to the fact that the area of the annular space between the base of conical spreader 7 and the base of the outwardly-flared or frusto-conical portion 4 is substantially equal to the cross sectional area of tubular portion 3 of the holder and the cross sectional area of bundle 26 contained therein, the filaments which project from the lower end of the holder 2 are maintained in closely arranged and relatively stiff relationship and thus form an effective annular erasing surface. The larger area provided by the space between the apex of the conical spreader member 7 and the upper end of frusto-conical portion 4 is very desirable, because the relatively stiff filaments 26 must bend as they pass down between the spreader member 7 and the frusto-conical portion 4, and this bending causes a certain amount of separation of the filaments. Also, the larger area just mentioned is desirable to reduce the friction offered to longitudinal movement of the filaments by thrust from the piston or ram provided by the end of shaft 1.

When the device of my present invention is rotated by a pneumatically, electrically, or mechanically operated machine, the shaft 1 is rotated by such machine, which rotation is effective in driving the holder and the abrasive erasing filaments disposed therein. The holder is preferably held at an angle to the surface being erased so that the lower, annular, projecting edge of the abrasive filaments, where such edge contacts said surface is substantially parallel to the surface being erased. When the device of my present invention is used as a simple, manually-operated eraser, the holder is inclined with respect to the plane of the surface to be erased and is held between the thumb and fingers of the operator much in the same manner as an operator would hold a pen or pencil, a slight reciprocating, oscillating, or circular movement being imparted to the holder, with a portion of the annular end of the filaments in contact with the matter to be erased from the paper, parchment, or like surface to effect the desired erasing operation. Obviously, when continued abrasion wears away the projecting ends of the filaments, the eraser may be restored to its initial efficiency by thrusting shaft 1 against the upper end of the bundle of filaments to cause the lower ends of the filaments to protrude the desired amount from the lower end of the filament holder. This operation may be repeated as the eraser is used and until the filaments are so shortened by abrasion that they will not be displaced longitudinally, at which time the inner end of shaft 1 is in contact, or nearly in contact, with the apex of cone 8. When the filaments have been used up, a "refill" consisting of a new bundle of filaments may be readily inserted in the holder for future use.

It is to be understood that the form of my invention herein shown and described is to be taken as a preferred embodiment of my invention, and that various changes may be made in the shape, size, and arrangement of parts without departing from the spirit of my invention or from the scope of the subjoined claims.

Having thus described my invention, I claim:

1. An eraser holder comprising a hollow member, a spreader member within one end portion of said hollow member with the outer surface of said spreader member spaced inwardly from the inner surface of said one end portion, a first strip extending across said one end portion and secured thereto, and a second strip extending across said one end portion and secured thereto, said spreader member engaging said strips and being retained within said one end portion of said hollow member by said strips.

2. An eraser holder comprising a hollow member, a spreader member within one end portion of said hollow member with the outer surface of said spreader member spaced inwardly from the inner surface of said one end portion, a first strip extending across said one end portion and secured thereto, and a second strip extending across said one end portion and secured thereto, said strips each having a sharpened upper edge directed toward that end of said hollow member opposite said one end portion, said spreader member engaging said strips and being retained within said one end portion of said hollow member by said strips.

3. An eraser holder comprising a hollow member having a pair of spaced slots through one end portion thereof, a spreader member within said one end portion of said hollow member with the outer surface of said spreader member spaced inwardly from the inner surface of said one end portion, said spreader member having a pair of spaced slots therethrough, and a strip extending across said one end portion of said hollow member with the ends of said strip secured within the slots in said one end portion, said strip being secured within the slots in said spreader member for retaining said spreader member within said one end portion of said hollow member,

4. An eraser holder as defined in claim 3, wherein the pair of slots in said one end portion of said hollow member are alined with the pair of slots in said spreader member, and in which the strip is a straight strip secured within said pairs of alined slots.

5. An eraser holder comprising a hollow member having a frusto-conical end portion having circumferentially-spaced pairs of slots extending therethrough, a conical spreader member within said end portion and having its outer conical surface spaced inwardly from the inner surface of said frusto-conical end portion with the bases of said end portion and conical spreader member in substantially coplanar relation, said conical spreader member having circumferentially-spaced pairs of slots extending therethrough, a first strip extending across said one end portion and secured within one of the pairs of slots in said end portion and one of the pairs of slots in said conical spreader member, and a second strip extending across said one end portion and secured within the other pair of slots in said end portion and the other pair of slots in said conical spreader, said strips retaining said spreader member within said end portion of said hollow member.

6. An eraser comprising a hollow member, a spreader member within one end portion of said hollow member with the outer surface of said spreader member spaced inwardly from the inner surface of said one end portion, means secured to said one end portion and extending across the space between said spreader member and said end portion and engage by said spreader member to retain the same within said one end portion of said hollow member, a bundle of abrasive filaments within said hollow member, and means for forcing said bundle of filaments through said hollow member into contact with and beyond the spreader member to a position where an end of said bundle of filaments projects outwardly beyond said one end of said hollow member.

7. An eraser comprising a tubular member having a frusto-conical end portion, a conical spreader member within said end portion of said tubular member with its outer conical surface spaced inwardly from the inner surface of said frusto-conical end portion, means secured to said end portion and extending across the space between said conical spreader member and said end portion and engaged by said spreader member to retain the same within said end portion of said tubular member, a bundle of abrasive filaments within said tubular member, and a shaft extending into said tubular member from the end thereof opposite said frusto-conical end portion, said shaft fitting within the bore of said spread member within said end portion of said tubular member with a relatively tight frictional fit, and said shaft and tubular member being axially slidable with respect to each other whereby the end of said shaft within said tubular member will engage the end of the bundle of filaments and will force the same through the tubular member into contact with and beyond the spreader member to a position where an end of said bundle of filaments projects outwardly beyond said end portion of said tubular member.

8. An eraser comprising a shaft having a solid lower end providing a piston or ram, a hollow tubular member fitting over the lower end of said shaft and extending axially beyond said lower end of said shaft, said tubular member being movable longitudinally relative to said shaft, a bundle of stiff abrasive filaments within the interior of said hollow tubular member and having its upper end abutted by said solid lower end of said shaft and having its lower end projecting from the lower end of the tubular member, said lower end of said tubular member being frusto-conical, a conical spreader member wholly enclosed by and having its outer surface spaced inwardly from the inner surface of said lower frusto-conical end of the tubular member, and means extending across the space between said conical spreader member and said frusto-conical end of the tubular member for securing the conical spreader member to the lower frusto-conical end of the tubular member, said means permitting the filaments to move endwise past it and acting to hold the bundle of filaments against rotation with respect to said conical spreader member and said frusto-conical end of the tubular member when the shaft and tubular member are rotated about their common axis.

9. An eraser comprising a shaft having a solid lower end providing a piston or ram, a hollow tubular member fitting over the lower end of the shaft and extending axially beyond said lower end, said tubular member being movable longitudinally relative to the shaft, a bundle of stiff abrasive filaments within the interior of said hollow tubular member and having its upper end abutted by said solid lower end of said shaft and having its lower end projecting from the lower end of the tubular member, said lower end of said tubular member having a frusto-conical portion, a conical spreader member wholly enclosed by and having its outer surface spaced inwardly from the inner surface of said lower frusto-conical portion of the tubular member, and means securing the conical spreader member to the lower frusto-conical portion of the tubular member, said means extending across the space between the conical spreader and said frusto-conical portion and permitting the filaments to move endwise past it freely and acting to hold the bundle of filaments against rotation with respect to said conical spreader member and said frusto-conical portion when the shaft and tubular member are rotated about their common axis, the annular space between the apex of the conical spreader member and the upper end of the frusto-conical portion of the tubular member being greater than the annular space between the base of the conical spreader member and the lower end of the frusto-conical portion of the tubular member so that the filaments may bend and separate somewhat as they move past the apex of the conical spreader member, the area of the annular space between the conical spreader member and the frusto-conical portion end of the tubular member becoming less as the lower ends of the frusto-conical portion and of the conical spreader member are approached and said area at said lower ends being substantially equal to the area of the hollow tubular member above the frusto-conical lower end and above the apex of the conical spreader member.

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