PIERCER Filed March 13, 1944

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2,390,309

Fig.4. Fig. 2. Fig. 5. Fig. 1. 1 14 14 5 47 9 T 15 :// 6 //: 16-13 3 F 15 12 12 16 10 10 Fig. 6. <sup>7</sup> Fig. 7. з. **Fig. 3**. Inventor: Theodore Franklin Keys, 2 Pierce + Scheffler, By

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# UNITED STATES PATENT OFFICE

#### 2,390,309

#### PIERCER

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### Application March 13, 1944, Serial No. 526,224

#### 5 Claims. (Cl. 164-119)

This invention relates to adjustable devices of general application for piercing light metals, cloth and the like or for forming openings in cans and boxes, or in the covers of jars, in which liquids or powdered materials are packaged.

It usually is desirable to provide an air vent as well as a pouring opening in cans containing such liquids as condensed or evaporated milk, fruit juices or beer, and to provide several openings in cans and boxes containing powdered materials 10 such as spices or detergents. The vent opening and the pouring opening will usually be of different sizes, and the particular sizes that afford a free flow of liquid or powder will vary with the density and flow characteristics of the liquid or 15 powder.

Objects of this invention are to provide piercers or punches having gage sleeves that are adjustable along the tapered punch to determine the size of the opening to be formed. Other objects 20 are to provide piercers having sharp-pointed tapered piercing elements and gage sleeves that are adjustable to one end position to sheath the point to prevent injury or to a desired position along the pointed piercing elements to determine the size of the perforation that is to be made. More specifically, objects are to provide a piercing device having a combined gage and guard sleeve that is adjustable along the shaft of the tapered piercing element and is secured, either positively or impositively, against detachment from the piercing element.

These and other objects and advantages of the invention will be apparent from the following specification when taken with the accompanying 35 drawing in which:

Fig. 1 is an elevation, with parts in section, of an adjustable piercer embodying the invention, the gage sleeve being adjusted to form a relatively small size opening;

Fig. 2 is a similar elevation illustrating the gage sleeve adjusted for the formation of the maximum size opening;

Fig. 3 is a fragmentary sectional view, on an enlarged scale, showing the gage sleeve adjusted to end position to shield the punch tip of the piercing element;

Figs. 4 and 5 are elevations, with parts in section, of another embodiment of the invention; the gage sleeve being illustrated in its respective end 50 positions in the views; and

Figs. 6 and 7 are transverse sections on an enlarged scale showing the spring connector element in normal position locking the sleeve against mover.ent towards the handle of the piercing de-55

vice and in retracted or unlocking condition, respectively.

In the embodiment of the invention that is illustrated in Figs. 1 to 3, the shaft of the piercing element includes a threaded section ( that is separated from the relatively long conical point 2 by a short unthreaded section 3. A handle 4 at the opposite end of the shaft is preferably of a translucent or colored thermo-setting or thermoplastic material that may be threaded and screwed on, or molded directly upon or cemented to the shaft. The portion I' of the shaft within the handle is of non-circular cross-section to obtain a strong mechanical bond, and, preferably, the shaft comprises a cylindrical rod of steel or other hard metal that is threaded from one end towards the conical point to produce the noncircular portion I' that is embedded in the handle and the threaded portion 1. Longitudinal grooves 5 may be cut in the threaded section I' to lock the handle 4 against removal from the shaft. The handle 4 is a body of revolution with a small flat surface 4a at its outer end and a shoulder 4b that flares from the inwardly tapering portion 25 to provide a seat for the thumb and first finger of the hand in which the handle is held.

A gage sleeve 6 is screwed upon the shaft before the handle is attached. A relatively large diameter counterbore 7 at the outer end of the sleeve 6 clears the unthreaded shaft portion 3 and permits the sleeve to be turned down on the shaft to serve as a guard sheath for the sharp point of the conical perforating portion 2. The relatively short threaded section 8 of the sleeve cannot pass the unthreaded portion 3 of the shaft, and the sleeve 6 is therefore positively retained against removal from the shaft as soon as the handle 4 is fixed to the shaft. A part 9 of the outer surface of the sleeve is knurled or otherwise roughed to afford a good friction grip for turning the sleeve threads 8 down tightly on the end of the threaded shaft section 1. The sleeve is thereby frictionally anchored against inadvertent rotation and there is no possibility of damage to the sharp point or from the sharp point when the device is not in use.

The methods of adjusting and using the piercing tool will be apparent from the foregoing description. The size of the punched opening depends upon the adjustment of the sleeve **6** along the threaded shaft **1**. Adjustments for punching a small vent opening and a large pouring opening in a can **10** are shown in Figs. **1** and **2** respectively. The size of the opening may be varied progressively from small pin point size to the maximum size, and the exact size that the operator desires may be obtained for a single opening or a large number of openings. It is convenient to use  $\frac{1}{4}$ " stock for the shaft of a piercing device for household use but it is to be understood that the invention is not limited to any particular size. The relatively long conical point 2 can be pressed into a can or metal top by a comparatively small force but the particular cone angle is not critical. A taper or cone angle of from about 14° to 20° will 10 be quite satisfactory and, in the illustrated embodiments, the angle is about 16° 30'.

The embodiment illustrated in Figs. 4 to 7 provides a step-by-step adjustment of the size of the pierced openings and, for many purposes, this 15 limitation to a selection from some six to eight sizes is quite satisfactory. The conical point 12 and handle 14 may be and preferably are substantially identical with the parts previously described. A narrow stop groove 13 is cut in the 20 shaft above the point 12 and a number of circumferential grooves 11, with radial upper surfaces and outwardly flaring lower surfaces, are cut in the main body of the shaft for cooperation with a stop spring 15 carried by the gage sleeve 25 and point shield 16. The spring 15 is of generally U-shape with inwardly bent legs that seat within diametrical slots 17 cut through the wall of the sleeve 16. The intermediate portions of the spring legs normally extend into the interior of 30 the sleeve 16 for engagement with the upper radial walls of the grooves il or to seat within the narrow stop groove 13. The spring 15 may be pressed inwardly, as shown in Fig. 7, to move the spring legs out of the bore of the sleeve 16 as 35 the flared ends of the spring are spread by engagement with the inner walls of the slots 17.

The sleeve 16 may be moved upwardly, into the position shown in Fig. 4, when the spring 15 is pressed inwardly. This corresponds to adjustment of the gage sleeve for the maximum size opening. The sleeve may then be pressed downwardly into the desired adjustment, the spring 15 being spread by engagement with the lower sloping surfaces of the grooves 11. The sleeve 45 will not be inadvertently stripped from the shaft during this adjustment towards smaller size perforations as the legs of the spring 15 snap into the stop groove 13 when the lower end of the sheath 16 is somewhat below the tip of the conical 50punch section 12. The sleeve 16 may be removed from the shaft by pressing the spring 15 inwardly to clear the stop slot 13 but this removal is obtained only by a deliberate manipulation of the spring 15. 55

The locking of the adjustable sleeve to the shaft of the piercing device is an important feature of the invention as the practical value of small shop and household devices depends upon their immediate availability for use when needed. 60 The gage sleeve cannot be removed from the shaft in the first form of the invention and there is but little likelihood that the sleeve will be lost from the modified construction.

I claim:

1. A piercing tool comprising a unitary shaft having a conical point section at one end thereof, a relatively short cylindrical section adjacent said

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conical section, a shank section adjacent said cylindrical section and a handle section as the other end of the shaft, the diameter of said cylindrical section being at least equal to the diameter of the large end of said conical section and to the maximum transverse dimension of said shank section, a gage sleeve slidably engaging said shank section and counterbored to extend over said cylindrical section and said conical section, cooperative means on said shank section and said gage sleeve for positioning said gage sleeve longitudinally of said shaft and means adjacent said conical section for impositively securing said sleeve in position with its counterbored end extending over said conical section.

2. A piercing device comprising a unitary shaft having a conical point section at one end thereof. a handle section at the other end thereof, a shank section extending between said conical section and said handle section, screw threads extending along said shank section and terminating in thread endings adjacent said conical section, a handle secured to said handle section, a gage sleeve internally screw threaded at one end to run on the screw thread on said shank section and counterbored at the other end to pass over said conical section, said handle and said conical section constituting stops limiting the movement of the gage sleeve along the shaft, and said screw thread endings on said shank section serving impositively to secure said gage sleeve at the end of its travel along the shank section.

3. A piercing tool comprising a shaft terminating at one end in a conical point section, the shaft being threaded from a point spaced from the conical point section to its other end, a handle of plastic material molded upon the threaded end of the shaft, a gage sleeve having internal threads at its inner end for threaded engagement with the threaded section of the shaft and counterbored from its outer end to clear the unthreaded shaft section, the length of the counterbore being somewhat greater than the combined length of the unthreaded and the conical point sections of the shaft.

4. A piercing tool comprising a shaft terminating at one end in a conical point section, a handle secured to the other end of the shaft, a gage sleeve adjustable axially of the shaft, a plurality of circumferential grooves in said shaft having radial upper surfaces and outwardly flaring lower surfaces, a spring having ends seated in diametrical slots of said sleeve and projecting into the bore thereof to cooperate with the radial surfaces of said grooves, and a narrow stop slot for recceiving the ends of said spring on adjustment of the sleeve to an end position in which it extends below and sheaths the tip of said conical point section.

5. A piercing tool as recited in claim 1, wherein said spring is of generally U-shape with inwardly bent legs terminating in outwardly flared ends engaging the walls of the slots in the sleeve, whereby the inwardly bent portions of the spring legs are moved outwardly to clear the bore of the sleeve when the base of the spring is pressed towards the sleeve.

THEODORE F. KEYS.

# CERTIFICATE OF CORRECTION.

December 4, 1945.

Patent No. 2,390,309.

## THEODORE F. KEYS.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, second column, line 60, claim 5, for the claim reference numeral "1" read --4-; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the

Patent Office. Signed and sealed this 12th day of February, A. D. 1946.

## Leslie Frazer

First Assistant Commissioner of Patents.

(Seal)