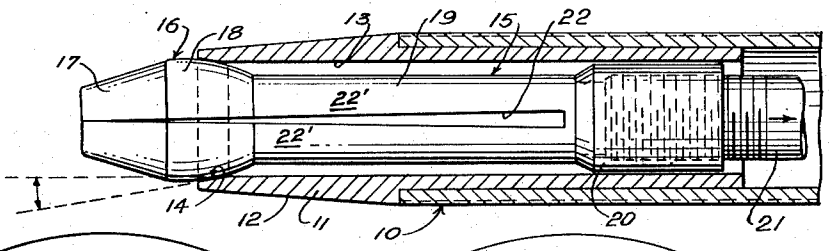
Aug. 6, 1957 G. GIGLI 2,801,613

LEAD GRIPPING MEANS FOR LEAD HOLDERS

Filed March 30, 1955

FIG. 1.



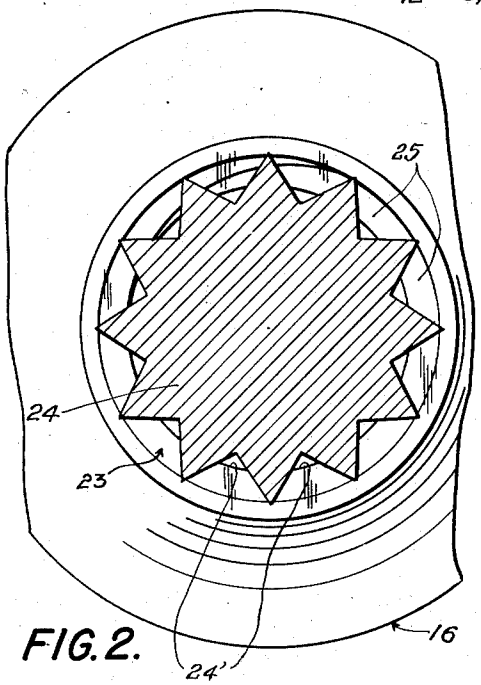


FIG. 2.

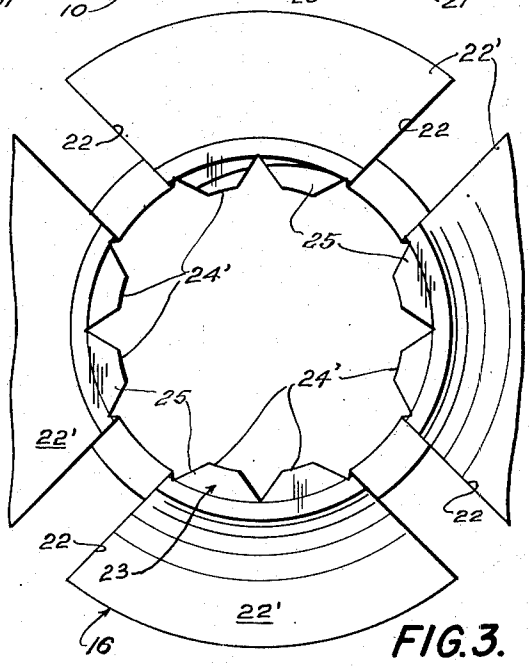
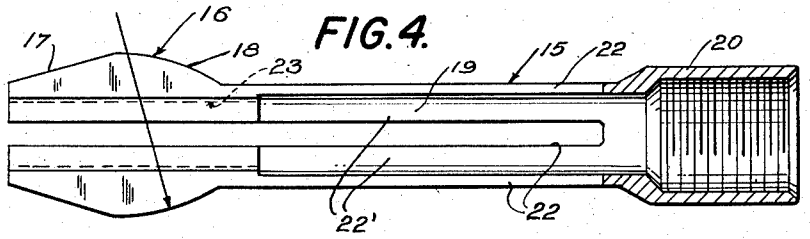


FIG. 3.

FIG. 4.



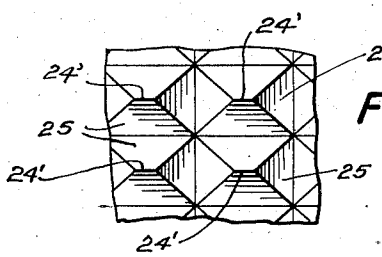


FIG. 5.

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LEAD GRIPPING MEANS FOR LEAD HOLDERS

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Application March 30, 1955, Serial No. 498,001

3 Claims. (Cl. 120—21)

This invention relates broadly to writing or drawing implements and particularly to what is known as lead holders of the mechanical type, and especially concerns the lead gripping means of such lead holders and its construction and the method of producing it.

In lead holders of the type indicated there is usually employed a lead gripping collet operative in what is termed the nose piece which serves for compressing the collet against the lead, thus gripping the latter. Such collet usually comprises a tubular, split and compressible structure having a double conical head and a tubular body extending into the nose piece where it is joined with an operating member for the collet. The splitting of the collet provides resilient prongs which, when drawn into the nose piece, are compressed to grip the lead. The movement of the collet into the nose piece is effected either by spring action or by the operation of a screw arrangement.

Heretofore employed lead holders were usually designed to accommodate leads of substantially uniform diameters or sizes, but they can not accommodate or effectively hold leads ranging from very small to relatively large diameters.

The present invention contemplates the provision of a lead gripping structure for holders which will accommodate leads of various sizes ranging in diameters, for instance, from .060" to .120", and to positively hold any of the leads against axial slippage and turning. This advantageous feature of the present invention is accomplished by two novel structural coacting arrangements of the collet and of the nose piece as shall be explained presently.

The prime object of this invention therefore is the provision of lead gripping means for holders which will accommodate and positively grip any lead within a group of leads varying in diameters from a certain minimum to a certain maximum.

The foregoing and other objects of the present invention will become more fully elucidated in the following description in conjunction with the accompanying drawings, wherein:

Fig. 1 is a typical illustration, partly in cross section, of a nose piece and a collet combination in accordance with the present invention;

Fig. 2 is an enlarged end view of the collet disclosing a broach in cross section;

Fig. 3 is a similar end view of the collet with the broach removed and with the collet head and its body split;

Fig. 4 is a longitudinal cross section taken through the collet; and

Fig. 5 is an enlarged detail view of the interior lead gripping surface of the collet.

In Fig. 1 of the drawings numeral **10** indicates the body or barrel of a lead holder or mechanical pencil into the end of which is fitted nose piece **11**. The latter has a conical exterior surface **12** and a substantially

spacious cylindrical interior **13** terminating at its left end in a short, steep conoidal seat **14**.

Within nose piece **11** is a mobile compressible collet **15**, shown enlarged in Fig. 4, and comprises a head, a body and an inner attachable end. The head **16** constitutes a substantially double cone-shaped, short body, the central part of which being of a rather large diameter. The frontal portion **17** of the head is conoidal, while its inner or rear portion **18** is of a spheroidal shape. That latter portion is adapted to forcibly engage conoidal seat **14** of the nose piece, as seen in Fig. 1.

Connected with spheroidal inner portion **18** of the head is the cylindrical collet body **19**, the outer diameter of which is very substantially smaller than the inner diameter of the nose piece, whereby a generous space between these two elements is provided.

The interior or attachable end of the collet discloses an internally threaded socket **20** for receiving operating or lead-holding tube **21** by means of which collet **15** is rendered axially movable within nose piece **11**, socket **20** just clearing interior **13** of the nose piece so that it can freely operate therein.

While the connecting means between the collet and lead-holding tube **21** is shown in the form of socket **20**, any other equally practical connecting arrangement can be substituted as long as it will facilitate unrestricted movement through tube **21** and through the collet of lead of the largest diameter contemplated to be placed into the holder.

In Fig. 4 it will be seen that the cylindrical interior of collet body **19** is spacious and that the body and head **16** are split longitudinally by slots **22**, whereby individual, resilient prongs **22'** are formed. These prongs are adapted to automatically spread apart the moment spheroidal head portions **18** clear short conoidal nose piece seat **14** as the collet is moved by tube **21** in outward direction, that is opposite to that indicated by the arrow in Fig. 1. That automatic spreading of the collet prongs is greatly facilitated by the generous spacing between the collet body and the nose piece interior.

As will be also seen in Fig. 4, head **16** is provided with threaded passage **23** concentric with but of a much smaller diameter than the very spacious cylindrical interior of body **19**, and which body interior is intended to accommodate leads of the largest diameter to be carried in the holder. The length of internally threaded head passage **23** substantially corresponds to the total length of head **16**.

It will be noted that the prong portions formed from the collet body are made very thin in order to render them highly resilient. Due to their thinness and resiliency the connecting areas between these prong portions and the split head portions or head segments are rendered sufficiently flexible to provide individual body mobility of these head segments so that the latter can readily adjust themselves relative to one another and likewise in respect to the outer surface of a lead passing through the collet.

The adjustment of the head segments becomes automatic due to the cooperation between the spheroidal inner segment surfaces and the short, steep conoidal surface of nose piece seat **14**, and further due to the line contact at which the head segment surfaces engage the seat surface. Thus when the collet is forcibly drawn into holder **10** in the direction of the arrow indicated in Fig. 1, the spheroidal segment faces effect a line contact with seat **14**, and due to the flexible connection between the segments and the prong portions formed from the collet body, the head segments are caused to securely grip the lead portion passing through the head.

Before splitting the collet to form prongs, the internally

threaded head passage **23** is broached along its full length. In Fig. 2 broach **24** is shown in section as its piercing teeth transect and remove alternate thread portions to the full depth and over the full length of the thread, whereby a series of deep axial recesses are formed. The spacing between the broach teeth is such that uniformly spaced sections **24'** of the interior thread periphery, as well as thread portions **25** retained between the broached-out portions are left intact.

The retained thread portions **25**, shown enlarged in Fig. 5, constitute a multiplicity of individual, substantially pyramidal lead-gripping projections of a uniform height and which are uniformly distributed over the entire surface of interior head passage **23**.

Lead-gripping projections **25** are designed to effect a positive gripping action upon lead placed into the collet. Such positive gripping action can be effected only if substantially all of projections **25** are caused to uniformly engage the lead over substantially the entire length of the latter's surface portions located directly opposite to the rows of these projections extending from each of the head segments. Moreover, these projections must imbed themselves rather deeply into the lead body to effectively prevent slippage and turning of the lead in the collet.

Such positive and effective gripping action is made possible by the aforedescribed individual mobility and automatic adjustability of the head segments as their spheroidal inner portions are caused to forcefully engage the steep, conoidal seat **14** of the nose piece.

While the collet seen in Figs. 1, 3 and 4 is split by four slots into four equal prongs, the number of prongs can be either increased or decreased, depending upon the type and sizes of lead to be held in the mechanical pencil. Irrespective of the number of collet prongs provided, the interior diameter of the collet body and that of the lead-holding tube must be sufficient to accommodate leads of the largest diameter contemplated to be placed in the holder.

In producing the collet, the stock from which it is made is first drilled, then the head is formed, whereupon the head and a portion of body **19** are threaded internally as indicated at **23** in Figs. 2, 3 and 4. The threaded interior of the collet is now broached axially and transversely to the thread, as clearly seen in Fig. 3. In Fig. 2 the required broach **24** is shown, disclosing twelve flutes and a corresponding number of pointed ridges. The points of these ridges pierce thread **23** to its full depth, while the bottoms of the flutes clear the interior periphery of the thread so that portions **24'** thereof are left intact. (See Fig. 3).

In observing the collet construction shown in Fig. 4, it will be noted that the interior lead-engaging threaded portion is exactly defined in that it extends along a relatively short distance corresponding in length substantially to that of head **16**. It will be also noted that the diameter of threaded portion **23** is substantially smaller than that of the adjacent interior of collet body **19**.

The offsetting of threaded portion **23** in respect to the enlarged interior of body **19** provides clearance for broach **24** as it passes through threads **23**. That clearance for the broach at the interior of body **19** assures broaching of the threaded area over the latter's total defined length. This is important to effect a secure grip of lead held in the collet so that both axial slippage as well as turning of the lead is prevented when the threaded and broached prong areas are brought into parallelism by the coaction of the spheroidal end **18** of the collet head with the conoidal surface **14** of the nose piece. That secure gripping action is also enhanced by the uniformity of the pyramidal formation clearly seen in Fig. 5.

As a result of that broaching operation, there is formed throughout the entire thread area a plurality of pyramidal projections **25**, clearly illustrated in Fig. 5, the apices of

which constitute the retained internal thread portions **24'**, pointing radially inwards. These projections are designed to partly pentrate into the body of a lead placed in the collet when the latter is compressed, and prevent both axial as well as turning movement of the thus gripped lead.

In order to effect secure gripping of leads by a collet, it is essential that the collet head is sufficiently compressed along its lead-gripping area and that that area assumes as nearly as possible the cylindricity of the lead. In heretofore designed collet and nose piece constructions, collets with very long double-conical heads were employed, and the end of the collet head cone adapted to be drawn into the nose piece usually was of a considerable length. Similarly the corresponding conical surface within the nose piece had to be gradual and of a substantial length. Such collet and nose piece construction necessitates a long travel movement of the collet before it is brought to the proper compressed, lead-gripping position. The long conical structures of the engageable collet head portion and of the nose piece interior has an additional disadvantage in that it causes binding of the collet within the nose piece and prevents a quick release of the lead, aside from the fact that a considerable effort is required to free the collet. Another disadvantage of such construction is that it limits the use of a collect to holding leads of substantially uniform diameters.

In addition to the above short-comings of heretofore employed truly conoidal collet head formations, it will be observed that when the collets hold leads of their intended diameters, their front ends will invariably remain partly open, since the collet prongs assume angular positions relative to one another and in respect to the lead. These short-comings account for the ready slipping and turning of the leads within the collet.

In the present construction the above outlined disadvantages of the heretofore used collet and nose piece arrangement have been successfully overcome. By making the surface of the engageable or interior cone end of the collet substantially short and spheroidal and by providing a substantially short, conoidal collet-engaging surface at the interior end of the nose piece and by providing the lead gripping surface within the collet as shown in Fig. 5, the travel of the collet in respect to the nose piece from the opening position of the collet for receiving the lead to its closing position of positively gripping it is shortened to a minimum. In addition the abrupt conoidal surface **14** within the nose piece end in cooperation with the spheroidal interior end of the collet head produces a unique self-positioning of the head within the nose piece due to the line-contact engagement between the two elements. As a result of that coaction of these elements, prongs **22'** are uniformly compressed and their interior lead gripping portions are brought close to parallelism when gripping lead of diameters within a certain range. This feature of the present invention constitutes a marked improvement over existing collet and nose piece constructions and assures a positive grip upon the lead by the collet, whereby both an axial movement as well as turning of the lead within the collet is effectively prevented. Especially responsible for the positive gripping action are the pyramidal formations **25** and their apices **24'**. The advantages of a collet-nose piece construction for accommodating and positively gripping a substantial range of leads of varying diameters obviates the employment of several holders, each one designed for a restricted range of lead sizes.

While the foregoing description of the present invention depicts a single embodiment thereof, it is quite obvious that minor changes and improvements of the device may be required when holders are to be constructed for leads of different grades or properties, such changes being deemed to reside within the scope of the present invention as defined in the annexed claims.

What is claimed as new is:

1. In a lead-gripping device for a lead holder adapted to accommodate leads of different diameters, two cooperating elements, one a spreadable collet, the other a nose piece in which the collet operates, said collet comprising a short head having outer and inner substantially cone-shaped portions, an internally spacious elongated body and an attaching end, the inner head portion being spheroidal, the outer diameter of the head being considerably larger than that of the body, the head and the body being split longitudinally into prongs, the split head forming segments, the prong portions made from the body being thin and resilient, the connection between the head segments and the body prong portion being flexible to render the head segments bodily adjustable; said nose piece having a cylindrical interior of a substantially larger diameter than the outer diameter of the collet body, a short, steep conoidal seat at the end of the cylindrical nose piece interior, said seat being adapted to become forcibly engaged by the spheroidal portions of the head segments whereby these segments are caused to bodily adjust themselves relative to one another and in respect to a lead placed into the collet, said adjustment of the head segments being facilitated by the flexible connection between the head segments and the prong portions formed from the collet body; the spreading of the collet prongs commencing immediately the moment the head segments are caused to clear the nose piece seat, said spreading of the collets being facilitated by the difference between the inner nose piece diameter and the outer diameter of the collet body.

2. In a lead-gripping device according to claim 1, and wherein the interior of the collet body is of a diameter sufficiently large to freely accommodate leads of the largest diameter contemplated to be carried by the holder, a passage provided through the head prior to splitting it, the length of the passage corresponding to that of the head, the diameter of the passage being substantially smaller than that of the body interior, a thread in the passage extending throughout its full length, spaced, longitudinal grooves transecting portions of the thread to its full depth and throughout its full length, whereby a plurality of individual lead-gripping projections are formed in said passage, said projections being of a uniform height and being uniformly spaced.

3. In a lead-gripping device, two cooperating instrumentalities, one being a compressible, automatically spreadable longitudinally split collet, the other forming a nose piece in which the collet operates, said collet constituting a multiple prong structure composed of thin, elongated resilient elements as parts of a cylindrical body and terminating in short, relatively thick, substantially double cone-shaped head segments having conoidal outer and spheroidal inner portions, the interior of the head segments having a lead-gripping surface composed of a plurality of individual, uniformly spaced lead-gripping projections; said nose piece having a cylindrical internal surface which is spaced substantially from said resilient element portions made from the body, said internal nose piece surface terminating in a short, steep conoidal seat adapted to be forcibly engaged by the spheroidal portions of the head segments; the connecting areas between the latter and said resilient prong element portions made from the body being sufficiently flexible so that when said spheroidal portions of the head segments forcibly engage said conoidal nose piece seat, the head segments are caused to bodily adjust themselves about a lead placed into the collet, whereby substantially all of their interior lead-gripping projections uniformly engage and securely hold the lead against slippage and turning.

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