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 [33] **Italy**
 [31] **53314-A/67**

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[54] **INK CARTRIDGES OF SYNTHETIC MATERIAL**
2 Claims, 13 Drawing Figs.
 [52] U.S. Cl..... **141/367**
 [51] Int. Cl..... **B65b 1/04,**
B65b 3/00
 [50] **Field of Search**..... **222/498,**
501, 541, 325; 141/311, 367, 326; 220/(Inquired)

ABSTRACT: An adapter for an ink cartridge including a closure for fountain pens with cartridge openers. The adapter having a plurality of surface means thereon respectively dimensioned and configured for accommodating differently dimensioned fountain pen cartridge openers and for permitting displacing force to be transmitted to the closure from a fountain pen cartridge opener of each of a corresponding plurality of sizes.

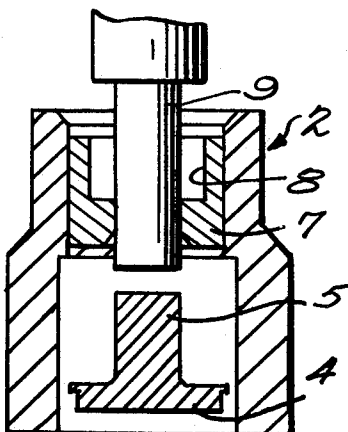


Fig. 1.

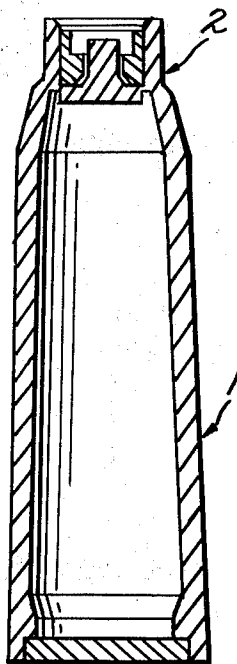


Fig. 4.

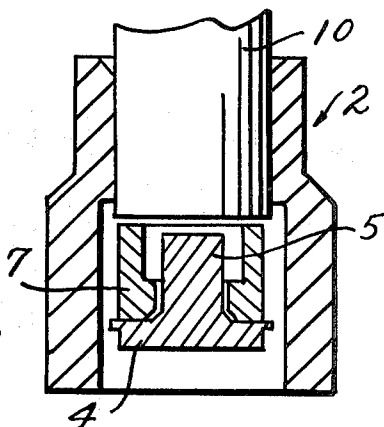


Fig. 5.

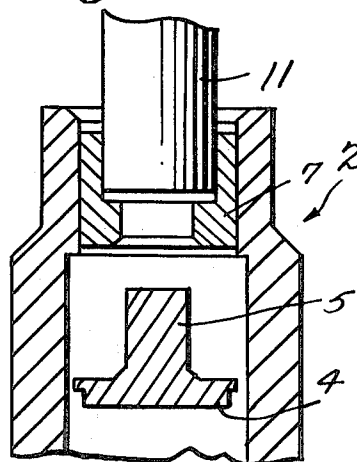


Fig. 6.

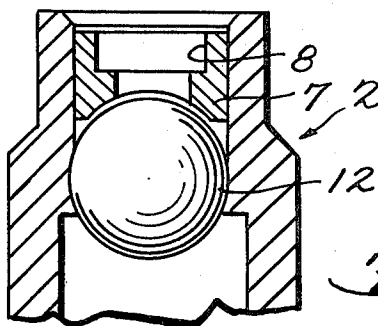


Fig. 2.

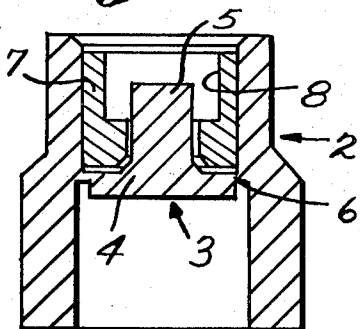


Fig. 7.

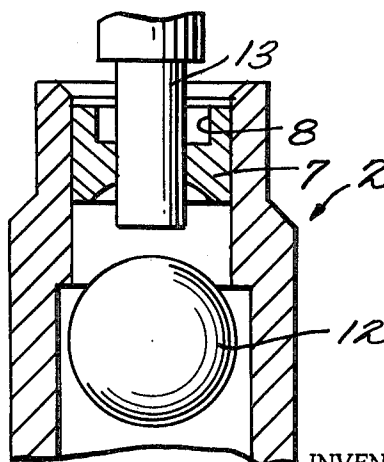
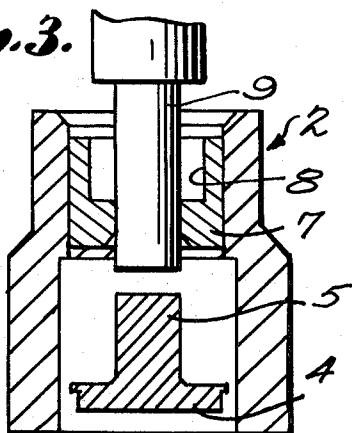


Fig. 3.



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Fig. 8.

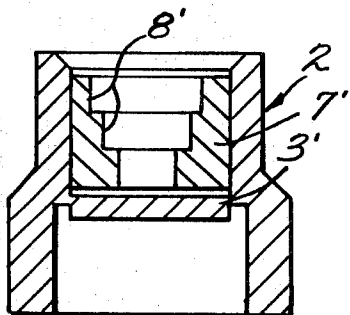


Fig. 9.

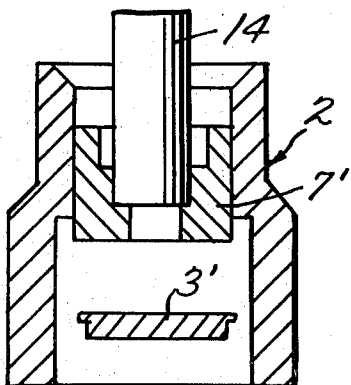


Fig. 10.

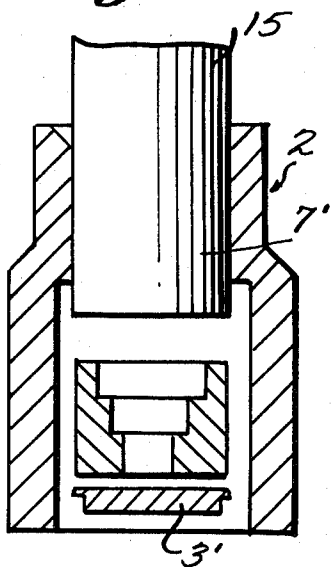


Fig. 11.

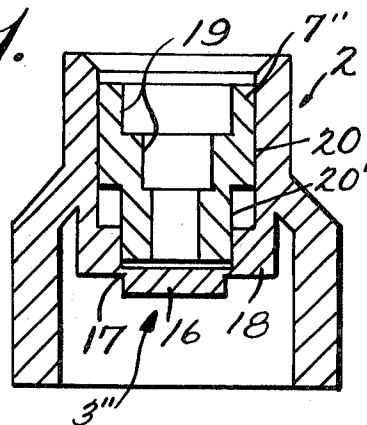


Fig. 12.

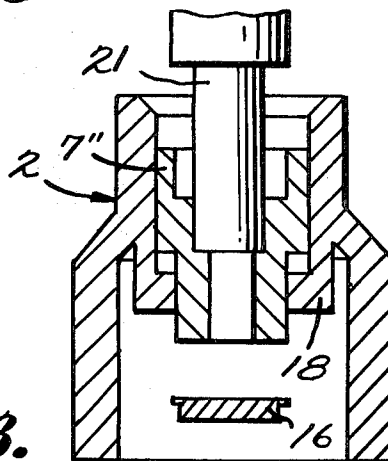
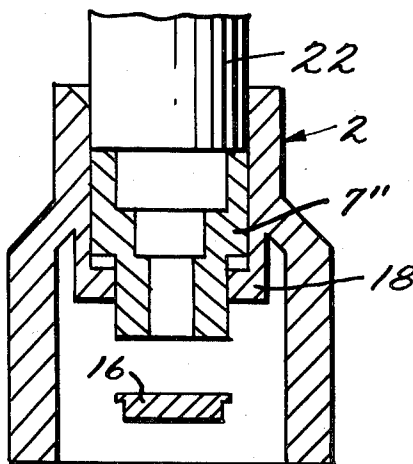


Fig. 13.



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INK CARTRIDGES OF SYNTHETIC MATERIAL

This invention relates to cartridges of synthetic material for ink or other liquids and particularly to a cartridge which can be used in writing instruments of various kinds, which are provided with means for opening the cartridge within the instrument and transmitting the fluid contained therein to the writing point.

As is known, ink cartridges, upon insertion into fountain pen of the type described are opened by means of a suitable opener, normally of cylindrical shape, connected with the pen feeder, and conveys the ink contained in the cartridge to said feeder.

The pen opener normally acts upon a circular face wall or end of the cartridge, on which wall a suitable closure is provided, which permits easy penetration of said opener into the ink cartridge under the action of an appropriate pressure exerted, in an axial direction, by the opener on said closure. The closure is generally made of diaphragms or membranes of suitable section and thickness, which form a single unit with the cartridge, or balls and/or plugs of suitable shape and material, which are introduced, with a close fit, into a suitable seat or hole provided in the face wall at the end of said cartridge.

When the ink cartridge is mounted in the fountain pen, the pen opener (which may be further provided with suitable cutting edges) is able to shear or rupture the membrane or diaphragm or to push the ball or plug towards the inside of the cartridge.

Further, ink cartridges are also known, which are apt to be utilized in different fountain pens, that is to say fountain pens wherein the size or the shape of the pen opener is different. Such cartridges are essentially of two kinds. In a first kind of cartridge two closures are provided, one at each of the two face walls forming the ends of the cartridge i.e. a closure of the diaphragm type and a closure of the ball type such as those used in the cartridges described above, respectively, which can be opened by means of openers of different shape and size. In a second kind of cartridge, provision is again made for two different closures, on the same face wall of the cartridges, i.e. a closure in the form of a diaphragm and a closure in the form of a ball disposed into a hole at the inside of said diaphragm, respectively, whereby opening of the ink cartridge can take place either by the action of an opener which pushes said ball into said cartridge (opener of smaller diameter) or by the action of an opener of larger diameter which shears or ruptures the diaphragm.

According to the present invention there is provided an ink cartridge for fountain pens or other writing instruments, comprising only a closure which can be of the diaphragm type, the ball type or the plug type, in at least one of the face walls forming the end of the cartridge, said closure being adapted to be opened upon insertion of the ink cartridge into the fountain pen, characterized in that in front of the closure an adapter or intermediate member is disposed for sealing the pen opener to the cartridge or for transmitting the force exerted by the opener upon the adapter to the closure to open the latter or to serve both of said purposes, depending upon the diameter of the pen opener.

The cartridge in accordance with the present invention has several useful properties and peculiar advantages which cannot be found in the cartridges of the prior art described above.

First of all, the provision of the adapter or intermediate member disposed in front of the closure of the ink cartridge permits manufacture of a single kind of "base" cartridge filled with ink and sealed, and therefore completely finished, on which different kinds of adapter or intermediate members can be subsequently mounted, whose dimensions are such as to permit cooperation with pen openers of predetermined dimensions, as desired. As soon as it is known in which pens such cartridges are to be utilized, one can insert thereon, with an extremely simple and rapid operation, the adapter or inter-

mediate member which will accommodate the opener of that pen.

The possibility of employing a single "base" cartridge which is to be mounted on different pens affords the manufacturer the great advantage of producing the latter at lower costs, due to the simpler equipment required and the lesser storing and distribution expenses.

For a better understanding of the advantages afforded to the manufacturer of the cartridge according to the present invention, it should be borne in mind that the various markets (corresponding to different geographical areas or to different countries) normally require ink cartridges which must be mounted on different fountain pens, and that in said areas or countries there exist peripheral storehouses to which the manufacturer supplies the cartridges of the ink required. With the present cartridge, it will be simply necessary to supply all these peripheral storehouses with the "base" cartridge and then separately the different intermediate members which will be subsequently mounted on the cartridges.

The adapter or intermediate member can also be manufactured on the spot, since it is of simple construction and does not require particular equipment for manufacture as is required for example, for the manufacture of the "base" cartridge.

The seller of the cartridges can further draw advantage from the fact that he will only have to keep in his shop or storehouse a single kind of cartridge, on which he can mount (or also replace) himself the adapter or intermediate member, as desired, to fit customer's pen.

The cartridge of the invention also affords the manufacturer of fountain pens the further advantage of a wide freedom in the design of said pens, since the dimensions of the pen opener can be of any size (and therefore the most suitable for a given design), provided that they are not larger than the maximum size allowed by the "base" cartridge.

Besides the advantages just mentioned, the cartridges in accordance with the invention still afford further advantages, as compared to those of the prior art. With respect to the kind first described (with closures on the two opposed faces) they have the advantage of simplifying the charging operation of the pen, since it is not necessary to determine which face of the cartridge must be directed toward the opener. Further, it has the advantage of being of simpler manufacture, since no close tolerances of manufacture must be maintained on both the face walls due to the provision of closures with respect to the second embodiment described wherein two closures are provided on the same end wall with the advantage that more than two openers can also be used.

For a better understanding of the present invention, reference may be had to the following description, given merely by way of example, of a number of particular embodiments thereof, taken in conjunction with the accompanying drawings, of which:

FIG. 1 shows a section of an ink cartridge, whose upper face is provided with the closure according to the present invention;

FIG. 2 is a partial section of the upper end portion of said cartridge, in which section a first embodiment of the present invention is shown;

FIG. 3 shows the cartridge of FIG. 2 into which a first opener of small diameter has been inserted, which has effected perforation of said cartridge;

FIG. 4 shows the cartridge of FIG. 2 into which a second opener of larger diameter has been inserted, which has effected perforation of said cartridge through the intermediate member or adapter;

FIG. 5 shows the cartridge of FIG. 2 into which a third opener of intermediate size has been inserted, which has effected perforation of said cartridge;

FIG. 6 shows a second embodiment of the present invention;

FIG. 7 shows the cartridge of FIG. 6 into which an opener of small diameter has been inserted;

FIG. 8 shows a third embodiment of the invention;

FIG. 9 shows the cartridge of FIG. 8 into which an opener of small diameter has been inserted, which has effected perforation of said cartridge through the intermediate member or adapter;

FIG. 10 shows the cartridge of FIG. 8 into which an opener of larger diameter has been inserted, which has effected perforation of said cartridge through the intermediate member or adapter;

FIG. 11 shows a fourth embodiment of the invention;

FIG. 12 shows the cartridge of FIG. 11 into which an opener of small diameter has been inserted, which has effected perforation of said cartridge through the intermediate member or adapter, and

FIG. 13 shows the cartridge of FIG. 11 into which an opener of larger diameter has been inserted, which has effected perforation of said cartridge through the intermediate member of adapter.

Referring first to FIGS. 1, 2, 3 or 4 of the accompanying drawings, an ink cartridge having a casing 1 and a face wall 2 (FIG. 1) is provided with a diaphragm or membrane generally indicated at 3 and comprising a central portion 4 with a projection 5 directed upwards, and a thinner annular zone 6 which connects said central portion 4 with the end portion 2 of the casing. The projection 5 is useful to permit perforation of the cartridge by means of openers whose length is comprised in a wide range. Above said diaphragm 3 an adapter or intermediate member 7 is provided, whose outer side surface is of cylindrical shape and cooperates with the inner cylindrical surface of the end portion 2 with a slight interference; the intermediate member 7 is further provided with a central aperture or hole into which the cylindrical projection 5 of said membrane is inserted. Suitably, said intermediate means is further provided with one or more cylindrical recesses or seats 8.

The intermediate member 7 can be made of any suitable material, such as for instance plastic material.

The embodiment of the closure of FIG. 2 described above permits use of said cartridge in three different fountain pens, whose openers are of different size. FIG. 3 illustrates the opening operation or perforation of the cartridge, effected by a fist opener 9 of smaller diameter; in FIG. 4, opening of the same cartridge is effected by an opener 10 of larger diameter.

During the opening operation or perforation of the ink cartridge, the opener 9 (FIG. 3) pushes on the projection of cylindrical shape 5 under the action of the pressures exerted thereon, thereby causing rupture or shearing of the material of the annular zone 6 of lesser thickness and causing the diaphragm 3 to fall inside of said cartridge. The opener 9 will penetrate inside the central opening of the intermediate member 7, fitting closely therein so as to establish a tight seal, whereby the ink can flow solely into the inside of said opener.

During the opening operation or perforation of said cartridge effected by means of the opener 10 (FIG. 4), the latter will not push on the diaphragm 3 directly but shearing or rupture of the annular zone 6 of the lesser thickness will take place through the intermediate member 7, thereby causing falling down or overturning of the diaphragm 3 at the inside of the cartridge. In this instance, the tight seal is obtained by virtue of the close fit of the outer cylindrical surface of the opener 10 with the inner cylindrical surface of the upper end portion 2 of the cartridge.

FIG. 5 shows the cartridge according to FIG. 2, which is perforated by an opener 11 of intermediate size. Said opener 11 will bring about rupture or shearing of the diaphragm simply by pushing on the portion of the projection of cylindrical shape 5 which protrudes from the bottom of the cylindrical recess 8; after shearing has taken place, the opener will come to rest on the bottom of said cylindrical recess 8.

Instead of a diaphragm of the kind indicated at 3 in FIG. 2, use can be also made of a closure member of different nature, such as for instance the ball 12 of FIG. 6. In this instance, also, there is provided an intermediate member 7 which acts in a manner quite similar to that described with reference to the

preceding embodiments. It is however to be noted that there is not reason for the lower surface of said intermediate member 7 to rest upon the ball 12, since the closure relies solely upon the close fit of said ball with the inner surface of the end portion 2 of said cartridge.

In FIG. 7 there is shown an opener 13 which, by pushing upon the ball, has brought about opening of the ink cartridge; in the same manner an opener of larger diameter, by exerting a pushing action on the intermediate member, could have similarly effected the opening of said cartridge.

FIG. 8 shows a third embodiment of the invention, wherein the perforation of the cartridge diaphragm again takes place by the action of the intermediate member. In this embodiment, the diaphragm 3' is of different shape, as compared with the diaphragm 3 of FIG. 2, due to the absence of the projection 5.

The intermediate member 7' is provided with a plurality of recesses 8'.

When an opener of small diameter 14 comes into action, it will come to rest, with its front face, against the bottom of one of the recesses 8' (FIG. 9) thereby pushing the intermediate member 7' downwards and bringing about shearing of the diaphragm 3'. It is to be noted that, by virtue of the provision of a plurality of recesses 8', the intermediate member can be pushed downwards by a plurality of openers whose diameters are slightly different from one another. When one of these openers exerts its action at the inside of one of said recesses 8', the intermediate member will perform a relative movement with respect to the cartridge, during which the perforation takes place; after the perforation is completed, said member will establish a tight seal for the ink, with the opener and the cartridge.

In FIG. 10 there is shown an opener 15 (whose diameter is as large as possible), which exerts a pushing action on the upper end face of the intermediate member 7', which acts in turn upon the diaphragm 3' in a manner quite similar to that described with reference to the preceding embodiments.

FIG. 11 shows a fourth embodiment of the invention, wherein a stop for the downward stroke of the intermediate member is provided, which therefore will never be pushed into the ink cartridge. In this instance, the diaphragm 3' comprises a circular middle portion 16 which is connected, by an intermediate annular zone 17 of lesser thickness, with a thicker annular zone 18. The intermediate member 7'' is provided with a plurality of recesses 19 coaxial to one another and is externally defined by two cylindrical walls of different diameter, 20 and 20' respectively; the former of these cooperates with the inner cylindrical wall 2 of the cartridge, while the latter cooperates with a cylindrical wall formed at the inside of the thicker annular zone 18.

An opener of smaller diameter 21 (FIG. 12) can enter into any of the holes 19 of the plurality mentioned above and, by pushing on the intermediate member 7'', bring about perforation of the circular central portion 16' of the diaphragm 3' after rupturing or tearing the material of the thinner annular zone 17.

An opener of larger diameter 22 can accomplish the same operation just described, by exerting a pushing action upon the upper face wall of the member 7''.

It will be apparent that modifications and variations can be introduced in the embodiments of the present invention described above, both to the shape and the arrangement of the various parts, without departing from the scope of the invention as claimed. In particular, in order to provide for replacement of the spent cartridge by preventing the intermediate member from being retained by the opener and from coming out from its seat in the cartridge, it can be suitable to provide a number of projections or lugs on the outer cylindrical surface of said intermediate member, which projections can cooperate with corresponding seats or recesses provided in the inner cylindrical surface of said end portion of the cartridge.

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I claim:

1. An ink cartridge for fountain pens having cartridge openers, the cartridge comprising:

a tubular casing having means defining an end wall at one end thereof and means defining a closure at the other end thereof to define an ink reservoir within the casing between the end wall and the closure; said closure being displaceable to provide communication between a pen receiving the cartridge and ink carried within the cartridge; a separate adapter mounted on the tubular casing outside the ink reservoir, closure; and

said adapter having a plurality of surface means thereon respectively dimensioned and configured for accommodating differently dimensioned fountain pen cartridge openers and for permitting displacing force to be trans-

mitted to the closure from a fountain pen cartridge opener of each of a corresponding plurality of sizes.

2. The ink cartridge of claim 1 wherein the closure comprises a membrane including a thick central portion and a thinner, surrounding frangible annular portion; wherein one said surface portion of the adapter comprises a peripheral, axially extending, opening defining wall adapted to receive and surround the thick central portion of the adapter comprises an annular surface adapted to abut the membrane adjacent the frangible annular portion so that the fountain pen cartridge opener can act directly on the membrane by contact with the thick central portion exposed through the opening in the adapted, or may act upon the adapter peripherally of the opening to indirectly transmit displacing force via the membrane abutting annular surface of the adapter.

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