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Plastic cartridge and plastic cartridge strip magazine

This invention relates to a plastics cartridge case having a plastics casing body open at one side for accommodating a propellant charge composition and an ignition charge for igniting the propellant charge composition when the ignition charge is subject to pressure, the cartridge case having a plastics cover sealing the open end of the casing body. Furthermore the invention relates to a cartridge casebelt magazine made of plastics and having a casing body strip which has several casing bodies connected to each other and a plastics sealing cover strip which has several sealing cover parts connected to each other for sealing the casing bodies.

Such plastics (propellant) cartridge cases are used in firing devices, in particular bolt guns of the most varied types. In this connection the cartridge cases are mostly integrated into magazine strips (cartridge case-belt magazine). Plastics cartridge cases can also be used, however, in centrally firing weapons. The advantages of plastics cartridge cases lie in particular, in the relatively low material and manufacturing costs; the cartridge cases can be manufactured using injection moulding technology. The above indicated plastics cartridge case and the plastics cartridge case-belt magazine respectively are disclosed in EP 377 924 A1 or EP 0 390 738 A1.

A certain problem with plastics cartridge cases exists in the initiation of the ignition charge by means of the firing pin. This is firstly because of the plasticity of the plastics material which damps the force of the striker, and therefore the momentum with which the firing pin strikes the cover or the casing body must be increased. Secondly the initiation of the ignition charge with plastics cartridge cases causes difficulties since the ignition charge is introduced between two plastics material layers. The deformation energy produced by the firing pin only yields a sufficient increase in temperature in the ignition charge under such conditions if the pressure

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(force/area) or deformation under this pressure in the ignition charge is far higher than the plastics allow. Sufficient pressure on the ignition charge can only be realised if the ignition charge is accommodated between  
5 two metal parts, as is the case with metal cartridge cases. Because of their intrinsic properties the ignition charges cannot be brought to any deformability (force/path). Because of the properties described here, of thermoplastics in particular, the use of  
10 plastics cartridge cases instead of metal cartridge cases in bolt guns or centre firing weapons designed for metal cartridge cases is not easily possible.

From US-A-2,679,803 there is known a cartridge for a toy in which the firing pin is guided in a passage in  
15 the cover or in a plug. A disadvantage of this constructional form is the very expensive manufacture since different parts must be connected with one another.

The underlying object of the invention is to  
20 create a plastics cartridge and a plastics cartridge case-belt magazine of the type mentioned in the introduction, which can be used without altering the device or the striker mechanism in conventional firing devices which have operated hitherto with metal  
25 cartridge cases, if necessary integrated into the charge strip.

According to the invention, this object is achieved with the features of claims 1 and 21.

In order to achieve this object, a plastics  
30 cartridge case is proposed with the invention which has a casing body, open at one side, for accommodating a propellant charge composition as well as an ignition charge for igniting the propellant charge composition when there is pressure action on the ignition charge  
35 and a cover for sealing the open end of the casing body, wherein a plastics ignition pin coupled to the cover is arranged in a chamber defined by the casing body and cover such that it is longitudinally displaceable in the axial direction, and wherein the

ignition pin is able to be moved when pressure is applied to the cover in the region of its coupling to the ignition pin and, in order to ignite the ignition charge, acts (mechanically) on this. With the cartridge  
5 case-belt magazine in accordance with the invention, several such cartridge cases are integrated in a magazine strip.

The cartridge case according to the invention is provided with an ignition pin, which is moved  
10 forward as a result of the striker acting on the cartridge case (cover) and thereby acts with its striking end on the ignition charge in order to initiate this. The striker energy is therefore converted into kinetic energy for the ignition pin,  
15 which, in turn, through deformation of the ignition charge, passes on this energy to the latter in order to ignite it. The ignition pin functions therefore as a transfer element for transferring the striker energy to the ignition charge. A transfer of the energy of the  
20 striker through the cartridge case wall, i.e. through the cover or casing body which is, in this respect, rigid, is not provided in accordance with the invention; rather, the cartridge case according to the invention is provided with an element, namely the  
25 ignition pin, converting the striker energy into kinetic energy. The damping of the striker energy by means of the plastics material is thereby substantially reduced relative to known plastics cartridge cases. Consequently the plastics cartridge case according to  
30 the invention may be produced with the aid of the striker mechanism designed for metal cartridge cases, without alterations being made to the devices.

In an advantageous further development of the invention it is provided that the striking end of the  
35 ignition pin acting on the ignition charge is formed tapering to a point, preferably like a cone, and the

ignition charge is arranged in a recess or indentation of the casing body which is also preferably conical and corresponds to the shape of the striking end. In the region in which the ignition charge is accommodated in the casing body this has a funnel shape. The surface of the recess extends preferably parallel to the outer surface of the striking end of the ignition charge. When the striking end of the ignition pin strikes the ignition charge, the striking end applies pressure to the ignition charge.

At the same time, however, particles of the ignition charge are also rubbed against each other so that the kinetic energy of the ignition pin in the ignition charge is converted into frictional energy. Because of the pointed conically shaped ignition pin and the funnel-shaped formation of the recess of the casing body accommodating the ignition charge, a large frictional path is thereby obtained. The frictional energy in the cartridge case according to the invention is therefore generated above all by an enlargement of the depth of penetration of the ignition pin-striking end in the ignition charge. This is favoured by the formation described here of the ignition pin-striking end and the casing body recess or indentation. Because of the "stab initiation principle" according to the invention an adequate ignition of the propellant charge composition is achieved with a lower quantity of ignition charge with a reduced portion of friction means, with the result that the fouling of the device, in particular erosion of the device is substantially reduced relative to the cartridge cases used hitherto.

With the aid of the above-mentioned ignition principle, in which the pointed striking end of the ignition pin penetrates an ignition charge brought into, as it were, the negative or counter shape

relative to the striking end and in which the funnel-shaped ignition charge formed thus is arranged in a recess or indentation corresponding to the shape of the striking end, a reliable ignition can be achieved

5 despite the arrangement of the ignition material between two comparatively relatively soft plastics parts, since the ignition material is rubbed when there is relative motion of the two plastics parts and is thereby heated. The frictional energy is obtained by

10 tangential displacement ("shearing action") of very small quantities of ignition charge (the layer thickness between the indentation wall and the striking end is thin), which forms through a self-forming pressing system (the pressure under which the ignition

15 charge layer lies becomes continually greater because of the conical faces of the striking end and of the indentation). The frictional heat is mainly obtained by an enlargement of the frictional path with reduced pressure values.

20 The ignition charge is advantageously given a hollow conical shape on introduction into the conical indentation of the plastics cartridge case. The ignition pin first plunges with its pointed striking end into the conical hollow chamber of the ignition

25 charge shaped thus. In this connection, energy is not required to displace the material of the ignition charge to all sides. Almost all the energy of the ignition pin can be converted into frictional energy when the ignition charge moves forward.

30 A further advantage of the plastics cartridge case according to the invention consists in that the ignition charge is arranged at a relatively large distance from the opening of the casing body or from the cover of the cartridge case. This has advantages

35 particularly when working with mass-produced tools; because the clean compression of the ignition charge

pellet introduced preferably as wet charge is now produced as the cartridge case (cover and/or casing body) is no longer fouled or is hardly fouled, when working in mass production as a result of ignition  
5 charge material flowing out during compression, because of the great depth to which the wet charge is introduced. The compression of the ignition charge pellet introduced is achieved solely through axial forward movement of the pellet feed plunger. The feed  
10 plunger also preferably has a conical point so that the above-described hollow conical shape is given to the ignition charge when compressing the ignition charge pellet.

The introduction of the ignition charge in  
15 the form of a wet charge has, as a first consideration safety advantages (freedom from dust). The "harder" constituents of the ignition charge (e.g. glass particles - as friction agent) can, on introduction of the ignition charge into the cartridge, be pressed into  
20 this comparatively soft plastics material, on account of which the ignition charge is "firmly held" by the cartridge. This effect occurs with the cartridge according to the invention both on introduction of the ignition charge as wet charge and even on introduction  
25 as dry charge.

In an advantageous further development of the invention, it is provided that the casing body has a first receiving chamber, corresponding in cross-section to the ignition charge, for accommodating the ignition  
30 charge and the ignition pin, and that the ignition pin is guided in a longitudinally displaceable manner in the first receiving chamber. The first receiving chamber preferably has, in this connection, the shape of a blind hole bore. The conical recess for (at least  
35 partially) accommodating the ignition charge is thereby advantageously arranged at the end opposite the opening

of the first receiving chamber. The ignition pin can rest in a sealing manner with its outer peripheral face on the inner face of the first receiving chamber. The first receiving chamber as well as the ignition pin are  
5 preferably cylindrical. With the formation of the first receiving chamber described here, the ignition charge can be introduced particularly easily into the cartridge case, without fouling of the cartridge case being caused by the ignition charge substance. The guiding on all sides of the  
10 ignition pin in the first receiving chamber guarantees a reliable guidance of the ignition pin without this being tilted.

In an advantageous further development of the invention, it is furthermore provided that the ignition pin  
15 has an enlarged cross-section in its region facing the cover for longitudinally displaceable guidance in the first receiving chamber, which cross-section is slightly smaller than or equal to the cross-section of the first receiving chamber. The rear part of the ignition pin is therefore  
20 enlarged in cross-section and rests in this region on the internal surface of the first receiving chamber. In the region of its striking end, the ignition pin is formed to be thinner, and therefore the pointed striking end is surrounded on all sides by the ignition charge material  
25 when it penetrates the ignition charge.

The ignition pin is preferably provided with an encircling radial sealing lip preformed in one piece for resting on the internal wall of the first receiving chamber. The sealing lip is thereby preferably formed so  
30 that, when the ignition charge is ignited, it is pressed against the internal surface of the first receiving chamber as a result of the increased combustion gas pressure. Leakage of the combustion gases from the first receiving chamber in a direction which is not intended is thereby  
35 prevented and a return movement of the ignition pin as a result of the contact pressure of the sealing lip against

the internal surface of the receiving chamber is stopped.

In an advantageous further development of the invention, it is provided that the cover has an increased flexibility in the region of the coupling to the ignition  
5 pin. This increased flexibility allows the forward movement of the ignition pin when the striker is acting on the cartridge case. The ignition pin is preferably connected to the cover as one piece with the connection being formed such that the ignition pin is able to be displaced in the  
10 axial direction whilst maintaining the connection with the cover. Such a connection can, for example, be realised by means of a corresponding elasticity of the cover in the region of the connection with the ignition pin. For this purpose it is advantageously provided that the cover is  
15 thinner in the rim region around the end of the ignition pin connected thereto than the cover in the remaining region. The intrinsic properties of the plastics of the cartridge case are such that the elasticity allows a movement of the ignition pin whilst maintaining the  
20 mechanical connection with the cartridge case.

The ignition pin is advantageously connected in a hinged manner to the cover at its end connected to the cover and facing away from the striking end. This hinged connection can for example be achieved by a film hinge or  
25 an annular diaphragm. All the connections named above have the advantage that the ignition pin can be manufactured in one piece with the cover as a plastics injection-moulded part.

An advantage is that if the hinged connection of the  
30 ignition pin and the cover is thus formed, the plastics material is not stretched at all when the ignition pin moves forward. This is realised by having the cover extend in the annular region around the ignition pin like a truncated cone rising to the ignition pin. The ignition pin  
35 is, in this connection, located in its

return position which it assumes in order to be moved forward when the striker acts. As soon as the striker has acted on the ignition pin, this is moved further forward into the casing body, with the annular region  
5 now extending decliningly to the end of the ignition pin; this is because, when the ignition pin is located in its forward position, the outer face of the cover or of the casing body projects above the end face of the ignition pin, the ignition pin therefore being pressed-  
10 in. The hinged connection of the ignition pin and cover or casing body has the advantage that the striker energy is not required for stretching the plastics material, the striker therefore striking the ignition charge with greater energy.

15 In an advantageous further development of the invention it is provided that the first receiving chamber has, next to its extended first partial chamber which corresponds in cross-section to the ignition pin, a second partial chamber which opens into the conical  
20 region of the first partial chamber. The ignition charge pressed into the first receiving chamber, and introduced preferably as wet charge, is introduced during working by means of the feed plunger into both the second partial chamber and also into the conical  
25 region of the first partial chamber of the first receiving chamber. The material of the ignition charge extends, as a result, as a continuous layer connecting both partial chambers to each other. The substantially lower portion of ignition charge material is found in  
30 the conical indentation of the first partial chamber. When the ignition charge material is ignited in the first partial chamber, the ignition charge material located in the second partial chamber also ignites accordingly. Consequently only a limited portion or  
35 region of the ignition charge is heated by friction beyond the self-igniting temperature. Because of the

low mass or the low volume of the ignition charge material in the first partial chamber, the heat emission is less when the ignition pin acts and therefore the ignition charge is more likely to ignite.

5               With the cartridge case according to the invention it is furthermore advantageous that the ignition charge and the propellant charge composition are accommodated in the casing body completely separated from each other. For this purpose both  
10 charges are accommodated in separate receiving chambers, with the partition wall separating both chambers from each other being formed as a bursting wall which break opens when the ignition charge is ignited. The bursting wall either has a wall thickness  
15 guaranteeing the breaking open starting at a certain (combustion) gas pressure in the first receiving chamber or having corresponding predetermined breaking points.

              The casing body in the region of the (second)  
20 receiving chamber for the propellant charge composition is advantageously provided with predetermined breaking points (star impression), in order to facilitate or enable a bursting open of the cartridge case when the propellant charge composition is ignited.

25               A fundamental problem when using plastics for cartridge cases, (practice) cartridges or the like is seen in the firmness of the material which is low relative to metal. Provided that the cartridge case (cartridge) is (almost) completely surrounded at all  
30 faces by this cartridge support, the relatively low firmness of the plastics is secondary. There is a problem, however, with those firing devices which operate with cartridge cases in magazines, e.g. with cartridge cases integrated in a magazine strip. In  
35 these devices, e.g. bolt guns, there are regions in the cartridge case support which, in some places, do not

surround the cartridge case, namely at those points, where the magazine strip is guided into the cartridge case support and out of this. In order also to be able to obtain sufficient stability and firmness of the

5 cartridge case wall at these sections of the cartridge case which lie in the transition region of the cover to the casing body, according to a further advantageous design of the invention it is provided that the cover

10 has a relatively thick encircling rim which projects into the interior of the casing body, and which extends along and close to the internal surface of the casing body or of the receiving chamber for the propellant charge composition. The cover introduced for its part preferably in a clamped and/or locking manner into the

15 casing body is secured against loosening when the propellant charge composition is ignited by means of the cartridge or cartridge case support.

Preferably the projecting rim of the cover which is able to be inserted into the opening of the

20 casing body overhangs downwardly the sealing lip of the ignition pin, this facilitating the placing of the cover.

As already mentioned above, the cartridge case according to the invention is able to be used for

25 firing devices with rim firing as well as for firing devices with centre firing. The ignition pin is located at different positions of the cover, depending on the type of device, namely, in the first case, in the rim region, i.e. away from the centre, and, in the

30 second case, in the central region of the cover. The exact arrangement of the ignition pin depends on the position of the striker of the firing device. It is advantageous for the above-mentioned stability or firmness of the cartridge case, to have the off-centre

35 arrangement of the ignition charge in the rim region with a firing device using cartridge cases in a magazine, with all ignition pins being arranged along

the centre line of the magazine belt. The ignition pin of a cartridge case is therefore arranged in the region facing the adjacent cartridge case. In this region the cartridge case support does not completely surround the casing body. When the cartridge case is ignited, the ignition pin has the effect of increasing the strength, since it is arranged between the propellant charge composition and the "laterally open" region of the cartridge case support.

The arrangement of the ignition pin in the rim region of the cartridge case has moreover the advantage that the ignition charge is protected from the environment only by the casing body wall. This protection, which is against external mechanical effects is sufficient and, moreover, if there are influences of heat on the cartridge case because of the thin walls of the casing body in this region, it allows the harmless burning-off of the ignition charge, the bursting wall between the ignition charge and the propellant charge composition preventing an over-ignition on to the propellant charge composition. As a result of the poor thermal conductivity of plastics, the ignition charge withstands a short heating effect (temperatures of more than 130°C are anyhow not critical). The ignition charge is particularly well protected with the preferred arrangement of the ignition charge on the longitudinal central axis of the magazine strip.

The above-mentioned advantageous designs of the cartridge case can also be used with the cartridge case-belt magazine according to the invention. The cartridge case-belt magazine according to the invention is formed substantially in two parts and consists of several casing bodies integrated in a plastics strip and several sealing cover parts integrated in a sealing cover strip for sealing the open sides of the casing

bodies. In order to be able to compensate for differences between the spacing of the casing bodies, on the one hand, and the spacing of the sealing cover parts, on the other hand, according to a further  
5 advantageous development of the cartridge case-belt magazine in accordance with the invention, it is provided that the individual sealing cover parts (by means of flexible film hinges) are connected to each other in an elastic manner. The plastics sealing cover  
10 strip extends in an arched manner in the region of its film hinges, i.e. spaced from the casing body strip. In this way the spacing of the adjacent sealing cover parts can be adapted to the spacing of the associated adjacent casing bodies.

15           The sealing cover can be just as wide as the sealing cover parts in the region of its film hinges; it is however also possible for the lateral edges of the film hinges to be formed with edge recesses. (Edge) release holes or openings directed towards the  
20 upper side of the sealing cover strip are thereby formed. Should there be escape of gas from a cartridge case between a sealing cover part and a casing body, a lifting of the sealing cover part or even an ignition transfer to an adjacent cartridge case is prevented, as  
25 the gas can escape by way of the release holes or openings in the region of the film hinge, before it reaches the adjacent cartridge case.

          The film hinges can also be formed like flexible tongues or bars with free-spaces lying  
30 therebetween; the free-spaces then represent the release holes or openings.

          The sealing cover strip is advantageously held in a clamping and locking manner on the casing body strip. For this purpose the casing body strip  
35 advantageously has, at both its longitudinal sides thickened edge strips overhanging the surface of the

upper side provided with casing body openings, said strips being substantially rectangular or square in cross-section. The sealing cover strip is mounted resting with its outer lateral edges clamped and  
5 locking on the internal surfaces of the edge strips formed like flanges, facing each other.

Both edge strips are directed laterally outwards away from each other at one end of the plastics casing body strip. Between the edge strips and the remaining  
10 part of the casing body strip free-spaces are formed at this end. The ends of the edge strips directed away from each other form a barrier which prevents introduction of the cartridge case-belt magazine when there is a false alignment.

15 The cartridge case-belt magazine according to the invention can be formed both as an annular magazine and as a linear belt magazine. When considering the casing body strip in plan view, the receiving chambers for the ignition charges are preferably arranged along  
20 the central line of the strip.

An exemplifying embodiment of the cartridge case-belt magazine according to the invention will be illustrated more closely in the following with the aid of the Figures. In detail,

25 Figure 1 shows a side view of a linear cartridge case-belt magazine with 10 cartridge cases in the assembled state,

Figure 2 shows a plan view on the upper side of the cartridge case-belt magazine, in which the upper  
30 side of the sealing cover strip can be identified,

Figure 3 shows a front view of the cartridge case belt magazine in the direction of the arrow III of Figure 1,

35 Figure 4 shows a plan view of a sealing cover strip end from below (without the casing body strip),

Figure 5 shows a section along line V-V of Figure 4 of the sealing cover strip, at one end thereof,

Figure 6 shows, in longitudinal section, a view of a casing body without the sealing cover,

Figure 7 shows a plan view on the casing body strip at its end 9 (without the sealing cover strip),

Figure 8 shows a cartridge case of the cartridge case-belt magazine, in section along the longitudinal central axis of the belt magazine (line VIII-VIII of Figure 2), with a striker not yet acting on the cartridge case.

Figure 9 shows a partial sectional view of the cartridge case according to Figure 8 with a striker acting on this and with an ignited ignition charge and propellant charge composition

Figure 10 shows a section along line X-X of Figure 2.

Figures 1 to 3 show a plastics cartridge case-belt magazine in side, plan and front view. The belt magazine 10 consists of two plastics strips connected to each other in a locking manner, namely a casing body strip 12 and a sealing cover strip 14. The casing body strip 12 has several casing bodies 16 arranged next to each other, which are connected to each other by way of plastics edge 17 of the casing body strip 12 and which, in each case, have a cap-type conical shape with a round base part 18 facing away from the sealing cover strip 14. The casing bodies 16, which are open towards the sealing cover strip 14, are closed off by the sealing cover parts 20 which are connected to each other in a hinged manner and integrated in a plastics belt 21 of the sealing cover strip 14. The casing body strip 12 has bead-like edge strips 22 at its two longitudinal sides. These edge strips 22 project upwards above the sealing cover strip

14 and between them enclose this in a clamping and locking manner. The casing body strip 12 as well as the sealing cover strip 14 are manufactured in one piece as plastics injection moulded parts. The casing  
5 bodies 16 form the cartridge cases 23 together with the sealing cover parts 20.

The more precise construction of the two strips 12, 14 of the belt magazine 10 is shown in Figures 4 to 7. The substantially rectangular sealing  
10 cover parts 20 are connected to each other by way of diaphragms acting as film hinges. The sealing cover strip 14 has a reduced thickness in the region of film hinges 24. The film hinges 24 are provided at both exposed edges with edge recesses 26. The importance of  
15 these edge recesses 26 is illustrated further below.

The sealing cover part 20 (one will be described in detail in the following as representing all sealing cover parts) has a closed collar rim 28 projecting downwards at right angles, which extends  
20 like a sickle. In the region defined by the rim 28, the sealing cover part 20 has a greater thickness than in the remaining regions (see Figure 5). The rim 28 extends to its free end, tapering conically; the external surface of the rim 28 extends perpendicularly  
25 to the upper side of the sealing cover part 20.

A plastics ignition pin 30 is connected in one piece to the sealing cover part 20 which, like the rim 28, projects downwards from the sealing cover part 20. The cylindrical ignition pin 30 has a larger  
30 diameter in the section which is adjacent to the end connected to the sealing cover part 20 than in the region of its free (striking) end 32. This free end 32 of the ignition pin 30 is conical and tapers to a point. In the transition region from the section of  
35 enlarged diameter to the section 30 of reduced diameter of the ignition pin, the ignition pin 30 is

provided with an axially open annular groove 34, so that a sealing lip 36 is produced on the section of enlarged diameter by stretching.

As can be seen in Figures 4 and 5, the  
5 ignition pin 30 is located next to the rim 28 of the sealing cover part 20, which rim extends like a sickle with the section of the rim 28 facing the ignition pin partially surrounding the ignition pin 30 and extending parallel to the periphery of the ignition pin 30. In  
10 the annular region 38 around the end 40 of the ignition pin 30 connected to the sealing cover part 20, the sealing cover strip 14 has a reduced thickness; the annular region 38 is formed like a diaphragm or a film hinge, which makes possible an axial movement of the  
15 ignition pin 30 whilst maintaining the connection with the sealing cover strip 14 or the sealing cover part 20. The annular region 38 extends to the end 40 of the ignition pin 30, rising in so doing with the end surface at the end 40 of the ignition pin 30 projecting  
20 above the sealing cover-outer face 42, if the ignition pin is located in the return or starting position represented in Figure 5. In this starting position, as will be described later, the striker of a bolt gun, for example, acts on the end 40 of the ignition pin 30, in  
25 order to move the ignition pin 30 forward axially into its forward position in which the striking end 32 acts mechanically on an ignition charge accommodated in the casing body 16. With an ignition pin 30 located in its forward position, the end face of the ignition pin end  
30 40 is located below the outer face 42 of the sealing cover part, with the annular region 38 extending decliningly to the end 40 of the ignition pin 30. As can be seen in particular in Figure 5 the sealing cover part 20 has a circular recess 44, in the region of  
35 which the ignition pin 30 is connected to the sealing cover part 20 by way of the film hinge-annular region

38.

The design of the casing bodies of the casing body strip 12 is illustrated in the following with the aid of the casing body 16 shown in Figures 6 and 7.

5 The casing body 16 has a first receiving chamber 46 and a second receiving chamber 48. The two receiving chambers 46, 48 are separated from each other by a partition wall 50 and are defined moreover by the wall of the casing body 16. The first receiving chamber 46  
10 serves to accommodate the ignition pin 30 and the ignition charge 52 already mentioned. The first receiving chamber 46 has, as a result, a substantially cylindrical partial chamber 56 formed like a blind hole bore, with the base of the bore being formed as a  
15 conical indentation 53. In the region of its opening 54, the first receiving chamber 46 has an enlarged diameter which facilitates the introduction of the ignition pin 30 when placing the sealing cover strip 14 on the casing body strip 12. The second receiving  
20 chamber 48 has opening 55.

Besides the substantially cylindrical first partial chamber 56 described hitherto, the first receiving chamber 46 also comprises a second partial chamber 58, which opens into the region of the conical  
25 end 53 of the first partial chamber 56. The two partial chambers are connected to each other by way of the conical wall of the first partial chamber. The second partial chamber 58 serves to accommodate the ignition charge 52, which is also accommodated  
30 partially in the first partial chamber 56, specifically in the region of its conical end 53. The second partial chamber 58 is separated from the second receiving chamber 48 by the partition wall 50.

The second receiving chamber 48 serves to  
35 accommodate propellant charge composition 60, which is ignited by the combustion gases forming when the

ignition charge 52 is ignited. The second receiving chamber 48 reaches into the region of the base 18 of the casing body 16, where the casing body 16 has on its inner side a star impression indicated in Figure 7 at 5 62 for producing predetermined breaking points.

The method of functioning of this is illustrated more closely in the following with the aid of the cross-sectional views of an assembled cartridge case 23 shown in Figures 8 and 9.

10 In the assembled state of the belt magazine 10, in which the sealing cover strip 14 is placed on the casing body strip 12, the rim 28 of a sealing cover part 20 is sunk into the second receiving chamber 48, its outer surface lying tightly on the internal surface 15 of the casing body 16, defining the second receiving chamber 48 in the region of its opening 55, and on the partition wall 50. In this state the ignition pin 30 is plunged into the first partial chamber 56 of the first receiving chamber 46, with its striking end 32 20 being arranged spaced from the conical indentation 53 at the end of the first partial chamber 56. The ignition pin 30 is located initially in its return position in which the end surface of its end 40 connected to the sealing cover part 20 projects above 25 the surface of the sealing cover part 20. Whilst the propellant charge composition 60 completely fills up the region of the second receiving chamber 48 below the sealing cover part rim 28, the ignition charge 52 has a hollow chamber 64 on its side facing the striking end 30 32. This hollow chamber is produced as a result of the type of introduction of the ignition charge during working. The ignition charge 56 is initially introduced as a wet charge pellet into the first partial chamber 56 of the first receiving chamber 46. 35 The wet charge pellet is then pressed right into the receiving chamber 46 with the aid of a feed plunger

with conical end, with the material of the ignition charge 52 being pressed into the second partial chamber of the first receiving chamber 46 as well as into the conical indentation of the first partial chamber 56.

5 Because of the conical shape of the end of the feed plunger, the material of the ignition charge 52 located in the first partial chamber 56 is brought into the shape shown in Figures 6 and 8, which resembles substantially a hollow cone. The conical end 53 of the  
10 first partial chamber 56 of the first receiving chamber 46 is therefore covered with the ignition charge material in a relatively thin layer thickness. On drying, the ignition charge 52 introduced as the wet charge retains its shape.

15 In order to render the cartridge operative, the striker indicated in Figures 8 and 9 by 66 acts on the end 40 of the ignition pin 30 connected to the sealing cover part 20, as a result of which this is pushed within the first receiving chamber axially in  
20 the longitudinal direction. In this process, the conical striking point 32 acts on the ignition charge layer at the conical end 53 of the first receiving chamber 46. Frictional heat is, in this connection, generated in the ignition charge layer, finally  
25 resulting in the ignition of the ignition charge material. The frictional heat is obtained to a very great extent because of the relatively long frictional path of the striking end 32 in the ignition charge layer; the pressure with which the striking end 32 of  
30 the ignition pin 30 acts on the ignition material has, in contrast, a secondary role. The selection of the material of the casing body (plastics) favours the ignition of the ignition charge 52, since the frictional heat generated in this hardly dissipates  
35 because of the relatively poor thermal conductivity of plastics. As soon as the ignition charge 52 is

ignited, combustion gases are generated. The gas pressure rising quickly in the first receiving chamber presses the sealing lip 36 of the ignition pin 30 against the internal wall of the first receiving  
5 chamber and provides for a gas-tight sealing of the first receiving chamber 46 outwardly and a high contact pressure, as a result of which the displacement of ignition pin 30 is in the direction of its return position is ensured against. The rise in the gas  
10 pressure finally results in the partition wall 50 bursting open, which in this respect (also) assumes the function of a bursting wall. The hot combustion gases flowing over from the first receiving chamber 46 into the second receiving chamber 48 ignite the propellant  
15 charge composition 60, as a result of which the casing body 16 in the base region 18 tears open, and the gas flow is released. The situation described here is shown diagrammatically in Figure 9.

As can be seen in Figures 8 and 9 the  
20 striking end 32 of the ignition pin 30 is located in its return position (Figure 8) spaced from the conical indentation 53 of the first receiving chamber 46, whilst the conical surface of the striking end 32 rests on the conical surface of the indentation of the first  
25 receiving chamber 46 when the ignition pin 30 is located in its forward position (Figure 9). In order that the ignition pin 30 can be moved forward in the axial direction to strike against the conical indentation 53 of the first receiving chamber 46, the  
30 plane in which the opening 54 of the first receiving chamber 46 lies is spaced from annular region 39 connecting the ignition pin 30 to the cover part 20. When the ignition pin 30 is located in its forward position, the annular region 38 extends partly around  
35 the end 40 of the ignition pin 30 in this free space above the opening 54 of the first receiving chamber 46

(see Figure 9).

In Figure 10 the clamping and locking connection of casing body strip 12 and sealing cover strip 14 is shown diagrammatically. The rim 28 of each sealing cover part 20 rests clamped on the inner face of each casing body 16 defining the second receiving chamber 48. Both edges 22 or edge strips of the casing body strip 12 project above the upper side of the sealing cover strip 14 and have on their internal surface facing each other undercut-recesses 68, into which the correspondingly shaped lateral edges 70 of the sealing cover strip 14 are locked.

As can be seen in Figure 2, the edges 22 of the casing body strip 12 have external edge recesses 72 which are arranged at the height of the film hinges 24 connecting the individual sealing cover parts 20. The recesses 72 do not extend over the whole thickness of the edges 22. With the recesses 72, the extent of this is predetermined by the distance by which the belt magazine 10 must be pushed forward in order to load the next cartridge case 23.

Both edges 22 are separated at one end of the casing body strip 12 from the remaining part thereof and extend outwardly being directed away from each other. The width of the casing body strip 12 at this end is therefore greater than in the remaining region of the casing body strip. In this way, an incorrect introduction of the belt magazine 10 into the shooting device is prevented.

The belt magazine 10 represented in the figures, or the cartridge cases 23 integrated in this belt magazine, have the features and properties specified in the following. The entire belt magazine 10 consists only of two injection(-moulded) plastics parts, namely the casing body strip 12 and the sealing cover strip 14. Each cartridge case 23 correspondingly

consists of only the plastics casing body 16 and the plastics sealing cover part 20. As a result of the conical striking end 32 of the ignition pin 30 and the conical indentation 53 in which part of the ignition  
5 pin 52 is accommodated, the frictional energy required for igniting the ignition charge 52 is generated by a relatively large frictional path when the striking end 32 acts on the ignition charge. Because of this stab initiation principle, the ignition charge 52 can be  
10 reliably ignited when there are correspondingly low ignition forces, despite its arrangement between two relatively soft plastics parts, namely the ignition pin-striking end 32 and the wall of the conical indentation 53 in the first receiving chamber 46. The  
15 ignition pin 30 is connected as one piece to the sealing cover parts.

The ignition charge 52 is introduced relatively deeply into the casing body 16 so that fouling in the region of the casing body opening 54, 55 and therefore  
20 leaks in the sealing cover parts do not occur. The ignition charge 52 may be accommodated by mere actual introduction of a charge pellet into the first receiving chamber 46. This axial introduction can be realized simply from the point of view of manufacture  
25 and accordingly at favourable cost. With the tool for this it is a question, for example of an axially displaceable plunger which presses the charge pellet axially into the first receiving chamber 46 up to the conical cavity therein. Several such plungers can  
30 operate simultaneously in order to charge a number of cartridges with the ignition charges. This is simpler, quicker and more favourable as to cost than the hitherto usual introduction of the ignition charges by  
35 "smearing" the ignition charge in the furrows of casings or cartridges with the assistance of a rotating screw-driver type of tool. The lateral arrangement of

the ignition charge may give rise in the case of combustion or heating, to ignition of the ignition charge, without danger, taking place outside the firing device without an over ignition to the propellant  
5 charge composition taking place.

The rim 28 of the sealing cover part 20 acting as a sealing lip is pressed by the gas pressure securely against the casing body-internal wall when the propellant charge composition is ignited, so that no  
10 gas can escape by way of the sealing cover part 20 and the ignition pin 30 is held clamped. By the selection of a suitable plastics, for example polycarbonate, and as a result of a correspondingly thick and high construction of the rim 28 of the sealing cover parts  
15 20, lateral bursting open of the cartridge case 23 in the upper region of the casing body, which is partially surrounded by the cartridge case bearing, is prevented to a very great extent. The ignition pin 30 is also held clamped when the propellant charge composition 60  
20 is ignited, and indeed as a result of the pressing forces of the sealing component part rim 28 which act by way of the partition wall 50 on the ignition pin 30.

If combustion gases should nevertheless escape by way of the sealing cover part 20, then  
25 further conveying to an adjacent cartridge case is prevented as a result of the rim recesses 26 of the film hinges 24 of the sealing cover strip 14. These rim recesses 26 act in the above described case like release holes or openings, by way of which the gases  
30 can escape before they reach the adjacent cartridge case 23.

The casing body strips and the sealing cover strips manufactured as belts can be injection moulded in a lattice, so that a multiple handling when  
35 manufacturing is possible with the simplest means.

Several casing body strips and several sealing cover strips are therefore manufactured separately.

Afterwards, the casing bodies arranged in the grid are equipped with ignition and propellant charge

5 compositions. The sealing cover part lattice is then emplaced. The introduction of the ignition pins into the openings 54 of the casing bodies is thereby facilitated by the first receiving chambers enlarged in the opening region. As the rims 28 of the sealing  
10 cover parts 2, project downwards beyond the sealing lips 36 thereof when the ignition pins 30 are located in their return position, the rims 28 are already sunk into the casing bodies, before the ignition pin can be pressed around if the sealing cover parts are placed  
15 without care. Also, an ignition pin 30 not extending coaxially to the first receiving chamber 46 can be introduced accordingly reliably and without problem into the first receiving chamber 46 when manufacturing the belt magazine.

20 When operating the cartridge 23, the quantity of ignition charge arranged like a funnel in the first receiving chamber 46 and the conical indentation 53, even when there is deformation of the ignition pin 30, force the latter into the "igniter" centre, thereby  
25 guaranteeing the correct functioning.



Claims

1. A plastics cartridge case having

- a plastics casing body (16) open at one side and for accommodating a propellant charge composition (60) and an ignition charge (52) for igniting the propellant charge composition (60) when the ignition charge (52) is subject to pressure action,

- the cartridge case having a plastics cover (20) for sealing (54,55) the open end of the casing body (16), characterised in that

- a plastics ignition pin (30) coupled to the cover (20) is arranged in chamber (46,48) defined by the casing body (16) and cover (20), such that it is longitudinally displaceable in the axial direction, and in that

- the ignition pin (30) is able to be moved when pressure is applied to the cover (20) in the region of its coupling to the ignition pin (30), wherein in order to ignite the ignition charge (52) the ignition pin (30) acts on this and

- the ignition pin (30) is connected to the cover (20) in one piece.

2. A cartridge case according to claim 1, characterised in that the striking end (32) of the ignition pin (30) acting on the ignition charge (52) is formed tapering to a point, preferably like a cone, and in that the ignition charge (52) is arranged in a recess (52) of the casing body (16) which is also preferably conical.

3. A cartridge case according to claim 1 or 2, characterised in that the casing body (16) has a first receiving chamber (46), corresponding in cross-section to the ignition charge (30), for accommodating the ignition charge (52) and the ignition pin (30), the ignition pin (30) being guided in a longitudinally displaceable manner in the first receiving chamber (46).





4. A cartridge case according to claim 2 or 3, characterised in that the first receiving chamber (46) has a conical shape tapering to a point at its end (53) opposite the opening (54).

5 5. A cartridge case according to claim 3 or 4, characterised in that the ignition pin (30) has an enlarged cross-section in its region facing the cover (20) for longitudinally displaceable guidance in the first receiving chamber (46), which cross-section is  
10 slightly smaller than or equal to the cross-section of the first receiving chamber (46).

6. A cartridge case according to one of claims 3 to 5, characterised in that the ignition pin (30) has an encircling sealing lip (36) preformed in  
15 one-piece for resting on and pressing against the internal surface of the first receiving chamber (46) when the ignition charge (52) is ignited.

7. A cartridge case according to one of claims 1 to 6, characterised in that the cover (20) or  
20 the wall of the casing body (16) has a region of increased flexibility in which the ignition pin (30) adjoins the cover (20) or the casing body (16).

8. A cartridge case according to one of claims 1 to 7, characterised in that the ignition pin  
25 (30) is connected in one piece to the cover (20) or to the casing body (16) such that, whilst maintaining the connection, it is able to be displaced in the axial direction.

9. A cartridge case according to one of claims 1 to 8, characterised in that the end (40) of  
30 the ignition pin (30) towards the cover (20) or the casing body (16) is connected by means of an encircling film hinge or an annular diaphragm (38) to the cover (20) or to the casing body (16).

35 10. A cartridge case according to claim 9, characterised in that the cover (20) or the casing body





(16) has a reduced thickness in the annular region (28) around the ignition pin (30).

11. A cartridge case according to claim 10, characterised in that when the ignition pin (30) has not yet been acted upon by pressure, the cover (20) or the casing body (16) extends in the annular region (38) around the ignition pin (30) like a truncated cone rising to the ignition pin (30).

12. A cartridge case according to one of claims 1 to 11, characterised in that the end surface of the ignition pin (30) at its end connected to the cover (20) or to the casing body (16) projects above the external surface of the cover (20) or of the casing body (16) when the ignition pin (30) has not been acted upon by pressure.

13. A cartridge case according to one of claims 3 to 12, characterised in that the first receiving chamber (46) has a partial chamber (58) which opens into the region of its conical end (53) and in that the ignition charge (52) is introduced into this partial chamber (58) and into the conical end region (53) of the first receiving chamber (46).

14. A cartridge case according to claim 13, characterised in that in the casing body (16) next to the first receiving chamber (46) for the ignition charge (52) there is formed a second receiving chamber (48) for the propellant charge composition (60) and in that the two receiving chambers (46, 48) are separated from each other by a bursting wall (50), the bursting wall (50) breaking open when the ignition charge (52) is ignited, so that the combustion gases reach the propellant charge composition (60) and ignite this.

15. A cartridge case according to one of claims 1 to 14, characterised in that the casing body (16) is weakened at its end opposite the cover (20) in the region of its wall defining the receiving chamber





(48) for the propellant charge composition (60) for bursting open when the propellant charge composition is ignited (60).

16. A cartridge case according to one of  
5 claims 1 to 15, characterised in that the cover (20) has an encircling collar rim (28) projecting inwardly into the casing body (16) and which rests on the internal surface of the casing body (16) which defines the receiving chamber (48) for the propellant charge  
10 composition (60).

17. A cartridge case according to one of claims 6 to 15 and 16, characterised in that, when the ignition pin (30) is located in its drawn-out position before being acted on by pressure, the collar rim (28)  
15 of the cover (20) overhangs downwardly the sealing lip (36) thereof.

18. A cartridge case according to one of claims 1 to 17, characterised in that the first receiving chamber (46) is arranged eccentrically in the  
20 rim region of the casing body (16).

19. A cartridge case according to claim 18, characterised in that the casing body (16) is formed with thin walls in the region of the end (53) of the first receiving chamber (46) provided with the ignition  
25 pin (30).

20. A cartridge case according to one of claims 1 to 19, characterised in that the cover (20) is inserted in a locking manner into the opening (54,55) of the casing body.

30 21. A plastics cartridge case-belt magazine which has

- a plastics casing body strip (12) which has several casing bodies (16) open to one side and connected to each other for accommodating respectively  
35 a propellant charge composition (60) and an ignition charge (52) for igniting the propellant charge





composition (60) and

- a plastics sealing cover strip (14), which has several sealing cover parts (20) connected to each other for sealing the open ends of the casing bodies (16), with the casing body strip (12) and the sealing cover strip (14) being coupled to each other, characterised in that

- that at least one ignition pin (30) movable in the axial direction is connected in one piece to each sealing cover part (20), and in that

- a first receiving chamber (46) is formed in each casing body (16) for accommodating the ignition pin (30) and the ignition charge (52), with the ignition pin (30) being guided in a longitudinally displaceable manner in the axial direction in the first receiving chamber (46) and, when subject to pressure action, acting on the ignition charge (52) in order to ignite this.

22. A cartridge case-belt magazine according to claim 21, characterised in that the first receiving chambers (46) are formed in each case like a passage with an end (53) tapering preferably conically to a point and in that each ignition pin (30) is also formed at its free end (53) facing away from the associated sealing cover part (20) tapering to a point, preferably conically.

23. A cartridge case-belt magazine according to claim 22, characterised in that the surfaces of the ignition pin (30) and of the end (53) of the first receiving chamber (46) extend parallel to each other and rest against each other when the ignition pin (30) is subject to pressure.

24. A cartridge case-belt magazine according to one of claims 21 to 23, characterised in that each ignition pin (30) has a sealing lip (36) for sealing and pressing against the internal face of the first





receiving chamber (46) when the ignition charge (52) is ignited.

25. A cartridge case-belt magazine according to one of claims 21 to 24, characterised in that a  
5 narrow annular region (38) of each sealing cover part (20) is formed flexibly around the end of the associated ignition pin (30) connected to this, like a film hinge or a diaphragm, which enables axial movement of the ignition pin (30) in the first receiving chamber  
10 (46).

26. A cartridge case-belt magazine according to claim 25, characterised in that the narrow annular region (38) of each sealing cover part (20) is formed around the associated ignition pin (30) with thinner  
15 walls than the remaining region of the sealing cover part (20) and rises to the end of the ignition pin (30).

27. A cartridge case-belt magazine according to one of claims 21 to 26, characterised in that the  
20 first receiving chambers (46) are slightly enlarged in cross-section at their sealing cover part ends.

28. A cartridge case-belt magazine according to one of claims 22 to 27, characterised in that each of the first receiving chambers (46) has an adjacent  
25 partial chamber (58) in the region of the conical end (53) and in that the ignition charge (52) is introduced in the region of the conical end (53) as well as in this partial chamber (58) of the first receiving chamber (46).

29. A cartridge case-belt magazine according to one of claims 21 to 28, characterised in that each casing body (16) has next to the first receiving chamber (46) a second receiving chamber (48) for the propellant charge composition (60), with the two  
35 receiving chambers (46, 48) being separated from each other by a bursting wall (50), which breaks open when





the ignition charge (52) is ignited.

30. A cartridge case-belt magazine according to one of claims 21 to 29, characterised in that each sealing cover part (20) is provided with a projecting  
5 collar-like encircling rim (28) which rests on the internal surface of the associated casing body (16) defining the receiving chamber for the propellant charge composition (60).

31. A cartridge case-belt magazine according  
10 to one of claims 21 to 30, characterised in that the individual sealing cover parts (20) of the sealing cover strip (14) are connected to each other by means of film hinges (24), the sealing cover strip (14) being disposed spaced from the casing body strip (12) in the  
15 regions of its film hinges (24).

32. A cartridge case-belt magazine according to claim 31, characterised in that, in the region of the adjacent sealing cover parts (20), the sealing cover strip (14) has release holes or openings in the  
20 respective film hinges (24) connecting the cover parts (20) to each other.

33. A cartridge case-belt magazine according to claim 32, characterised in that the release holes or openings are formed as rim edge recesses (26) of the  
25 film hinges (24).

34. A cartridge case-belt magazine according to one of claims 21 to 33, characterised in that the casing body strip (12) consists of a plastics strip (17) with cup-like indentations preformed on this and  
30 forming the individual casing bodies (16).

35. A cartridge case-belt magazine according to claim 33, characterised in that the plastics strip (17) has thickened rim strips (22) positioned on both longitudinal sides and formed like flanges.

35 36. A cartridge case-belt magazine according to claim 35, characterised in that the sealing cover





strip (14) rests with its outer lateral edges clamping and locked on the internal surfaces of the edge strips (22) which face each other.

37. A cartridge case-belt magazine according to claim 35 or 36, characterised in that both edge strips (22) at one end of the plastics strip (17) extend outwards, directed away from each other.

38. A cartridge case-belt magazine according to one of claims 21 to 37, characterised in that the sealing cover strip (14) and the casing body strip (12) are each linear.

39. A cartridge case-belt magazine according to one of claims 21 to 37, characterised in that the sealing cover strip (14) and the casing body strip (21) are each formed as closed annular strips.

40. A cartridge case-belt magazine according to one of claims 21 to 39, characterised in that the first receiving chambers (46) are arranged, seen in plan view, on the casing body strip along the strip centre line.

