

# PATENT SPECIFICATION

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## (54) FILM CASSETTE

(71) We, AGFA-GEVAERT AKTIEN-GESELLSCHAFT, a body corporate organised under the laws of Germany of 509 Leverkusen, Germany do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:

5 The invention relates to a cassette for a cinematographic film, in which the unexposed and the exposed film spools are arranged coaxially of each other. A cassette of this type consists of a substantially rectangular or square-shaped inner cassette element with a partition plate, having a fixed core for the feed spool fitted on one side and a storage pin for the take-up core extending on the other side, and a cassette casing which forms a light-tight seal with the inner cassette element for the film spools and which has a film window in one side face and an opening in a base which is perpendicular to this lateral face, which opening is adapted to allow engagement of the take-up spool with the drive mechanism of a cine-camera.

10 Cassettes of this type are inserted in cine cameras and are sold under the name Super-8 cassettes. They are described in U.K. Patents No. 1,096,300 and 1,031,930 for example. Commercially, these cassettes are sold filled with the film. After exposure they are sent by the user to a processing factory for development. The welded cassettes are forced open there and the film removed for photographic processing. The empty cassettes are then thrown away. This results in a considerable wastage of material.

15 20 25 30 35 40 45 A re-usable Super-8 cassette has been proposed in German Gebrauchsmuster No. 7,120,864. The cassette described in this Gebrauchsmuster is manufactured so that the exposed film can be removed through the film window of the cassette, without the cassette having to be destroyed. The cassette can then be re-loaded by opening the removable cassette casing. However,

since the cassette casing is normally welded to the inner cassette element, damage occurs in this operation. 50

An object of the present invention is to produce a re-loadable film cassette from which the entire exposed film can be removed for photographic development. Compatibility with all commercial Super-8 cine cameras must be maintained. A further requirement is that the operations required to open and close the cassette must not damage the apparatus. This means, in particular, that in the insertion of a new reel of film in the empty cassette, the normal steps in this operation must be maintained. This means that nothing may be changed in the cassette in the film path and on the side of the film supply chamber. Additional means for closing the cassette should be reduced to a minimum for economic reasons and should be suitable for mechanical operation. The cassette must be reliable for several opening and closing operations. 55

60 65 70 75 80 85 90 95 This invention therefore provides a cassette for a cinematograph film in which the unexposed and exposed film spools are arranged coaxially to each other, consisting of a substantially rectangular or square-shaped inner cassette element with a partition plate, on one side of which a fixed core for the film feed spool is placed and on the other side of which a hollow bearing pin for the take-up spool extends, a cassette casing for the inner cassette element, which forms a light-tight enclosure with the inner cassette element for the film spools and has a film window in a side face and an opening which is adapted to allow engagement of the take-up spool with the drive mechanism of a cine camera in a major face perpendicular to this side face, which cassette casing is closed on five sides and is only open on the face opposite to the film window, and whose major face opposite the cassette opening is provided with a hole through which a fastener is inserted, and a fastener for fastening the casing and the inner cassette element together, the fastener

engaging with a corresponding fastening means on the inside of the bearing pin and projecting beyond the open end of the bearing pin.	65
5 In contrast to this, known cassettes have the cassette casing open on three lateral faces. When the cassette casing is slipped onto the inner cassette element, both the major faces can easily be fixed, thus simplifying assembly. This is no longer possible with the cassette according to the invention, since both the major faces are firmly bound together by the additional side faces. This feature of the cassette according	70
10 to the invention causes problems in light-proofing of the take-up chamber. During insertion of the inner cassette element into the cassette casing, the film take-up core first rests on the bearing pin, so that a small gap remains between the highest point of the film take-up core and the base of the cassette casing above it. Otherwise the inner element could not be inserted into the casing. In order to ensure light proofing, between the upper edge of the film take-up core and the cassette opening in the loaded condition, the film take-up core is raised by the amount of the gap between the two components during insertion of the screw	75
15 plug, so that the labyrinthine upper end of the take-up core engages in the labyrinth at the end of the cassette opening. In this way light is prevented from penetrating the cassette opening and reaching the take-up chamber. It follows from this lifting of the take-up spool that the drive units on the camera are certain to engage in the dog of the take-up spool thus providing compatibility with normal commercial	80
20 camera systems.	85
25 30 35 40 A preferred way of firmly fixing the cassette casing and the inner cassette element is by means of a plastics screw, which for example has only 0.5 to 2 turns of thread with a relatively high pitch. Such screws can easily be produced by injection moulding. A screw plug of this kind can also be modified in the manner of a bayonet fitting. For this purpose, the shank of the screw is provided with cams which engage a corresponding latching device in the bearing pin.	90
45 50 55 60 When opening the cassette, the reverse order of operations is followed: that is, the screw is released and then removed. The cassette casing can then be removed. In order to simplify the removal of the screw plug, the hub of the take-up core is provided with an opening. The screw can then be	95
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In a particularly preferred embodiment of the invention, a frustoconically chamfered ring is applied concentrically to the bearing pin on the inner element of the cassette, on the side of the film feed spool, this ring engaging in the hole in the base of the cassette casing when the cassette casing and the inner element of the cassette are slid together. An initial locking of the cassette casing and the inner element is thus achieved even before insertion of the screw plug.	65
The advantages provided by the preferred embodiment of the cassette of the present invention consist in the fact that all parts of the cassette except the spool core can be reused after cleaning and inspection. In practice, the screw plug in bayonet form in particular, provides an easily managed and safe connection between the cassette casing and the inner cassette element. This connection can always be released without damaging the essential parts of the cassette. However, the closed cassette is adequately protected against unauthorised opening, since a label is normally stuck over the screw head on the exterior of the base, so that the screw plug is not visible.	70
Another advantage consists in the fact that the components which are required in addition to those of the standard Super-8 cassettes can easily be produced by the injection moulding technique, so that the cassette is not made significantly more expensive. Finally, there is another important feature, which is, that no major modification is required in the automatic packing machines which are already available, in order to pack the new Super-8 cassette. The additional machine parts which are required for inserting and driving home the screw plug can be provided without high expenditure and can be mounted on the machines which are already available without any great difficulty.	75
A preferred embodiment of the invention is described in detail below with reference to the accompanying drawings. For comparison purposes, a traditional Super-8 cassette is shown in section in Figure 1.	80
In the accompanying drawings:	85
Figure 1 shows a section through a traditional Super-8 cassette,	90
Figure 2 shows the cassette casing according to the invention in perspective and	95
Figure 3 the inner cassette element according to the invention with detached film pressure plate, screw plug and film take-up core, also in perspective.	100
The known Super-8 cassette according to Figure 1, comprises a cassette casing 1 which is open on three faces and which is	105

slid over an inner cassette element 2. Two mutual overlapping chambers, namely a film feed chamber 4 and a film take-up chamber 5 are separated by a partition plate 3 on the inner cassette element 2. A fixed core 6 for a film feed spool is situated in the feed chamber 4. In order to diminish friction while unwinding the film, the film spool in the feed chamber 4 is placed on a plastics disc 7. A bearing pin 8 which projects into the take-up chamber 5 is formed on the core 6. This pin forms the bearing for a spool core 9 in the take-up chamber 5. 5

When the cassette is inserted in a cine-camera, a driving mechanism on the camera side engages in a dog 11 through a cassette opening 10. The spool core 9 can be set in rotation by means of this. The film is thus drawn from the feed spool into the chamber 4, exposed in a film window and correspondingly wound onto spool core 9. The cassette casing 1 is permanently welded or stuck to the inner element 2 at a connecting point 12. For this reason, reuse is not possible: after removal of the exposed film for photographic development the cassettes are thrown away or at the most crushed to reclaim the raw materials. In contrast to this, the cassette of the present invention is re-usable: the cassette sent by the customer is opened in the processing laboratory, the exposed film removed and the empty cassette sent back to the film manufacturer. After examination for any faults the cassette is packed with a new film there, newly labelled and supplied to the customer. It is clear that considerable saving in materials is achieved by this recycling. 15

The cassette casing of the film cassette of the present invention, shown in Figure 2, readily illustrates several alterations in the earlier disposable cassettes. In contrast to the earlier model, it is closed on five faces, that is, the cassette casing 1 comprises both the major faces 13a, 13b and the three side faces 14a, 14b and 14c. The fourth face (right of illustration of the casing) is open. 20 The inner cassette element 2 can be inserted through this opening, like a drawer. A film window 15 is provided in the opposite side face 14b. The cassette opening 10 with a light labyrinth 16 is provided in the upper major face 13a. A hole 17 for a screw plug (see Figure 3) is opposite to the opening 10 in the lower major face 13b. The hole 17 is provided with a frusto conical extension 18 towards the interior. Recesses 19 are provided on the lateral edges opposite the film window which engage with corresponding locating lugs 32 on the inner cassette element when the cassette casing 1 and the inner cassette element 2 are slid together. Thus the ends of the bases are 25

protected against lifting in the closed position. 30

The side walls 20 of the inner element slide between the lateral faces or surfaces 14a and 14c when the inner cassette element 2 is inserted into the cassette casing 1. Thus exact control of the position of the inner element is obtained. The edges on these lateral surfaces are provided with light labyrinth 21, 22, which engage in corresponding labyrinth 23, 24 on the inner cassette element 2 during sliding together (see Figure 3). 35

Figure 3 shows the inner cassette element in an exploded perspective view. A film pressure plate 25 is fixed on the front face of the inner cassette element by means of an injection moulded spring clip 26. It ensures that the film is perfectly flat in the region of the film window 15. 40

The bearing pin 8 and the take-up core 9 which rotates round this pin are the most important components in the take-up chamber 5. In contrast to the known Super-8 cassettes the size of the spool core 9 is determined in such a way in this cassette that the highest point of the spool core 9, that is the ring face 27, lies directly under the face defined by a curved wall 28 on the inner cassette element, when the spool core 9 is placed on the bearing pin 8. Otherwise the spool core 9 would push against the upper major face 13a during insertion of the inner cassette element into the cassette casing. The spool core 9 is provided with a labyrinth 29 on the side face, this labyrinth corresponding to the labyrinth 16 on the cassette opening 10 in the cassette casing. The dog 11 serves to drive the spool core. A catch 30 injection moulded on the spool core 9 prevents the film spool from unwinding in the reverse direction. 45

The spool core 9 firstly lies with its lower edge 31 on the partition 3 in the cassette element. In this position, as described above, the inner cassette element is inserted into the cassette casing until the recesses 19 of the cassette casing lock in the projections 32 on the inner cassette element. Additional pre-locking of the cassette casing and the inner cassette element is thus obtained, if a frusto-conically chamfered ring 33 is moulded onto the fixed core 6 for the film feed spool concentric, to the bearing pin 8, which ring engages in the corresponding frustoconical extension 18 of the hole 17. The cassette must now be closed again. This is done with a screw plug 34. In order to close the cassette, the screw 34 is placed through the hole 17 and driven home with few rotations. Thus the threaded shank 35 taps a corresponding thread 36 in the inside of the pin 8 which is formed as a hollow member. In contrast to the traditional cassettes, the bearing pin 8 is penetrated to 50

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its spherical cap 37. The extended part 38 of the screw shank is inserted through the hole 37 in the bearing pin 8 when the screw 34 is inserted and screwed home. In this way the 5 film take-up core 9 is raised so that the labyrinth 29 engages in the labyrinth 16 of the cassette casing. The distance by which the core is raised lies in the range of 0.5 to 2 mm, depending on the type of cassette. In 10 this way light-proofing of the take-up chamber 5 is ensured. In addition, the dog 11 is assured of taking in the same height as in the former disposable cassettes.

According to a further embodiment, the 15 screw plug 34 is made of a thermoplastic material, for example from the same material as the cassette itself (black polystyrene) and is produced by injection moulding. In this case, the thread 36 in the 20 pin 8 must also always be moulded. A few turns are sufficient to produce a safe connection between the cassette casing and the inner cassette element. A plug element which is similar to a screw may alternatively 25 be provided, which is in the same form as the screwplug, but in which the fastening is a bayonet fitting. For this purpose notching cams are formed on the shank of the screw plug 34, and corresponding latching devices 30 are formed on the inner face of the pin 8. When the screw plug 34 is rotated (0.5 to 2 rotations) the cam of the screw engage in the latching devices within the bearing pin 8 and form a releasable but sure plug. In order 35 to protect the cassette against unauthorised opening, a label is suitably stuck on the screw head on the outside of the cassette casing.

When opening the cassette, the reverse 40 order is followed. In order to simplify removal of the screw plug 34, the hub of the film up-take core 9 is also open at hole 39. After unlatching, the screw plug 34 can easily be pressed out downwards with a pin 45 or similar tool, through the holes 39 and 37.

The take-up core 9 is thermally welded to the beginning of the film strip during packing. Then the film spool in the feed chamber 4 is wound round the core 6 and 50 the take-up core 9 with the end of the film fixed on it is placed on the bearing pin 8. At the same time it must be ensured that the film is correctly threaded up in the film channel which leads from the feed chamber 55 4 past the film gate 15 to the take-up chamber 5. The cassette casing 1 is correspondingly pushed over the inner cassette element 2 containing the film and the screw plug 34 is inserted and locked by 60 rotation. The cassette is labelled and packed

after examination. Since these procedures involve almost no welding, in contrast to the earlier disposable cassettes, the cassette can always be re-packed with another film and supplied to the customer.

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**WHAT WE CLAIM IS:—**

1. A cassette for a cinematograph film in which the unexposed and exposed film spools are arranged coaxially to each other, consisting of a substantially rectangular or square-shaped inner cassette element with a partition plate, on one side of which a fixed core for the film feed spool is placed and on the other side of which a hollow bearing pin for the take-up spool extends, a cassette casing for the inner cassette element, which forms a light-tight enclosure with the inner cassette element for the film spools and has a film window in a side face and an opening which is adapted to allow engagement of the take-up spool with the drive mechanism of a cine camera in a major face perpendicular to this side face, which cassette casing is closed on five sides and is only open on the face opposite to the film window, and whose major face opposite the opening is provided with a hole through which a fastener is inserted and a fastener (for fastening the casing and the cassette element together, the fastener engaging with a corresponding fastening means on the inside of the bearing pin and projecting beyond the open end of the bearing pin.

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2. A cassette as claimed in claim 1 in which the fastener is a screw plug.

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3. A cassette as claimed in claim 2 in which the screw plug is produced from a thermoplastic material by injection moulding.

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4. A cassette as claimed in claim 3 in which the screw plug has from 0.5 to 2 turns of thread.

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5. A cassette as claimed in claim 3 or claim 4 in which the screw engages with a corresponding thread in the bearing pin.

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6. A cassette as claimed in claim 2 in which the screw plug is made of metal and is provided with a self-tapping thread.

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7. A cassette as claimed in claim 1 in which the fastener is in the form of a bayonet fitting and a corresponding engaging device is provided in the bearing pin.

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8. A cassette as claimed in any of claims 1 to 7 in which the fastener projects from 0.5 to 2 mm beyond the open end of the storage pin.

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9. A cassette as claimed in any of claims 1 to 8 in which a frustoconically chamfered

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ring is applied concentrically to the bearing pin on the inner element of the cassette, on the film feed spool side.

5 10. A cassette substantially as herein described with reference to figures 2 and 3 of the accompanying drawings.

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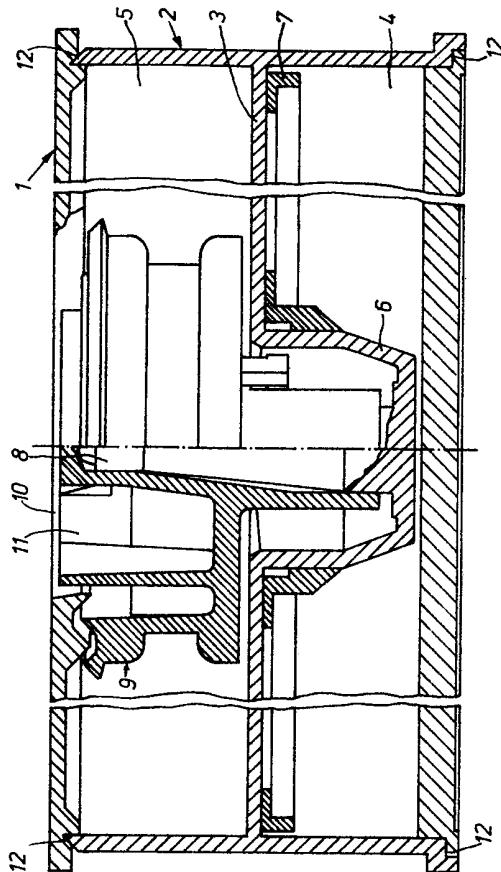


FIG. 1

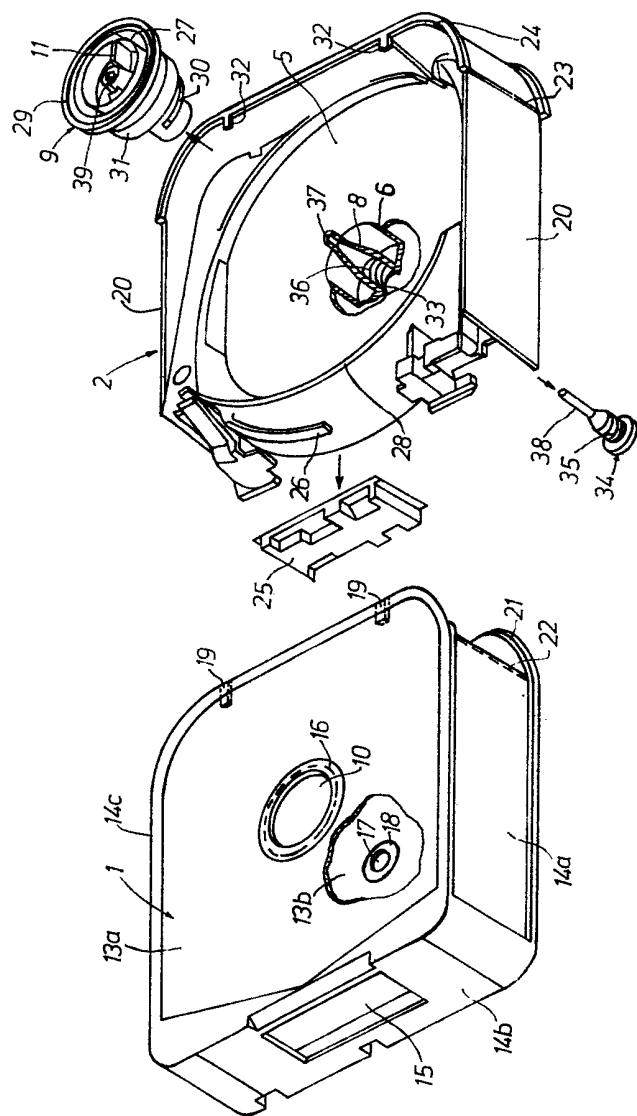


FIG. 2  
FIG. 3