

"PICK-UP UNIT FOR A TELEVISION CAMERA"

The invention relates to a pick-up unit for a television camera comprising a camera tube having at one end a window portion and at the other end a bottom portion, said camera tube being surrounded by coils on a coil former and said camera tube being centered relative to the
5 coil former near the window portion and near the bottom portion.

Such a pick-up unit is known from German Patent Application 26 07 728. In this unit the camera tube is centered with respect to the coil former near the window portion and near the bottom portion by means of O-rings. However, such O-rings are flexible and are hence
10 deformed irregularly so that an accurate centering of the camera tube relative to the coil former is not possible. In this known unit, the position of the coil former with respect to the camera tube viewed in the axial direction is indefinite. The camera tube can easily move in the coil former. Furthermore, the tube has a base with lead-through
15 pins for the electric connections of the tube on which a tube base is placed. As a result of this the overall length of the camera tube is comparatively large, which restricts the manufacture of compact portable cameras of small dimensions.

It is therefore the object of the invention to provide a pick-up
20 unit which has a simple construction and in which the position of the camera tube relative to the coil former is fixed more accurately in all directions.

The invention provides a pick-up unit as described in the opening paragraph characterised in that the camera tube is provided with
25 laterally led-through contact strips adjacent its bottom portion, that a sealing cap is provided at the end of the coil former facing the window portion, that the sealing cap has an abutting surface which extends perpendicularly to the axis of the coil former and is provided with an aperture, that the sealing cap includes means for centering the window
30 portion of the camera tube relative to the coil former, that a

15 tube base for the camera tube is connected to or forms part of the coil former, said tube base comprising means for centering the bottom portion of the camera tube relative to the coil former, resilient means for urging the camera tube against the abutting surface of the sealing cap, and contact means for contacting the laterally led-through contact strips of the camera tube.

Since the tube base forms part of the construction of the coil former, the length of the pick-up unit can be considerably reduced, which makes the pick-up unit particularly suitable for incorporation in small portable cameras. The camera tube does not comprise lead-through pins but has laterally led-through contact strips which contact contact springs provided in the tube-base. Such laterally led-out contact strips are described in the previously filed Netherlands Patent Application 8005230 (PHN 9840) which is hereby incorporated by reference. Centering means which centre the bottom portion of the camera tube relative to the coil former are also present in the tube base. At the end of the coil former facing the window portion a sealing cap is connected which has an abutting face against which the camera tube is urged by resilient means provided in the tube base. Means for centering the window portion of the camera tube relative to the coil former are also present in the sealing cap. In this manner the position of the camera tube is fixed both in the radial direction and in the axial direction relative to the coil former.

The pick-up unit according to the invention furthermore has the advantage that the position of the window of the camera tube is maintained when the camera tube and/or the coil former expand or contract. When the camera tube and/or the coil former expand or contract the resilient means present in the tube base is compressed to a greater or lesser extent while nevertheless the window portion of the tube remains urged against the abutting face of the sealing cap. As a result of this the scene to be recorded will remain sharply displayed on the target provided on the inside of the window.

The means for centering the bottom portion and the window portion of the camera tube may each be formed by three abutment members which project radially inwards from the circumference of a circle and

extend in an axial direction, one of said members being constructed so as to be resilient in the radial direction. The bottom portion and the window portion each engage two abutment members, the member which is resilient in the radial direction ensuring that the tube firmly engages said two abutment members.

The sealing cap may be detachably connected to the coil former and be connected in a metal screening sleeve in which the coil former is fitted. Usually a metal screening sleeve is provided around the coil former so as to screen the camera tube from interfering magnetic fields. The sealing cap is connected in the screening sleeve. By placing the screening sleeve around the coil former the sealing cap is urged against the coil former.

The screening sleeve may consist of a first and a second cylindrical portion, first portion abutting against a part of the coil former the outside diameter of which is equal to the outside diameter of the first portion of the screening sleeve, and the second portion comprising the said sealing cap and the inside diameter of which is selected so that it fits closely around the outside diameter of the first portion, the first and second portions being detachably coupled together. In order to prevent the sealing cap from working loose from the coil former, the screening sleeve is constructed as two parts. The first part surrounds the coil former partly and abuts against a part of the coil former which has an outside diameter equal to the outside diameter of the first part. In this manner the coil former assumes a fixed position relative to the first part of the screening sleeve. The second part having connected therein the sealing cap is moved over the free part of the coil former until the sealing cap engages the coil former, after which the first part and the second part are coupled together. In this manner a rigid engagement of the sealing cap against the coil former is ensured. Since in addition the two parts are detachably coupled it is possible to replace the camera tube in the pick-up unit in a simple manner in the case of tube defects.

In a detachable coupling in which the two parts need not be rotated relative to each other the first and the second part of the screening sleeve are coupled together by means of a ring which has at least two

internal wedge shaped parts extending along the direction of the circumference and increasing in the axial direction and which drive apart lugs which are connected at the facing ends of the first and second parts to such an extent the sealing cap connected in the first part is urged against the coil former.

An embodiment of the invention will now be described, by way of example, with reference to the accompanying drawing, in which

Figure 1 is a cross-sectional elevation of the pick-up unit,

Figure 2 is a cross-sectional view taken on the line II-II of Figure 1,

Figure 3 is a cross-sectional view taken on the line III-III of Figure 1,

Figure 4a shows diagrammatically a part of the screening sleeve,

Figure 4b is a plan view of the ring of the screening sleeve, and

Figure 4c is a cross-sectional view of the ring shown in Figure 4b.

Figure 1 is a longitudinal sectional view of the pick-up unit 1. The camera tube 2 has a window portion 3 and a bottom portion 4. In the side wall of the tube 2 near the bottom portion 4 conductive strips 5 are led out and are connected in the tube to the various electrodes. The tube 2 is surrounded by a system of coils 7 on a coil former 6. A tube base 8 which closely fits around the end of the coil former 6 facing the bottom portion 4 is attached to the coil former 6 by means of an adhesive so that after assembly, the tube base 8 and coil former 6 form one integral part. Alternatively, the coil former 6 and tube base 8 may be formed as a plastics moulding. A number of contact springs 9 are provided in the wall of the tube base 8 and engage the conductive strips 5 on the tube 2. Also present in the tube base 8 are three abutments (not visible in Figure 1) for centering the bottom portion of the tube 2, which will be further explained with reference to Figure 2. A sealing cap 10 is detachably connected to the end of the coil former 6 nearest to the window portion 3. The sealing cap 10 has a face 11 which is provided with an aperture 13 and which is perpendicular to the axis 12 of the coil former 6. The window 3 of the tube 2 engages the

face 11. A firm engagement of the tube 2 against the face 11 is produced by means of a spring 14 in the tube base 8 which urges the tube 2 against the face 11. The sealing cap 10 is provided with three abutments (not visible in Figure 1) for centering the window portion 3 of the tube relative to the coil former 6. The location and action of these abutments will be explained hereinafter with reference to Figure 3. The sealing cap 10 is detachably connected to the coil former 6. The sealing cap 10 is located in a μ -metal cap 15 which has an aperture 16 and which together with a μ -metal cylinder 17 forms a screening sleeve so as to screen the tube 2 from interfering magnetic fields. The cylinder 17 abuts against an edge 18 of the portion 19 of the coil former 6, of which portion 19 the outside diameter is equal to the outside diameter of the cylinder 17. The inside diameter of the cap 15 is selected so that it fits closely around the outside diameter of the portion 19 of the coil former 6. At its open end the cap 15 has circumferentially a number of lugs 20 and the cylinder 17 has a number of lugs 21 at its end which abuts against the edge 18 of the coil former 6. When the cap 15 with the sealing cap 10 connected therein is slid onto the coil former 6, the lugs 21 of the cylinder 17 slide into slots (not visible) provided in the cap 15. A ring 22 has on its inside two wedge-like portions which engage the lugs 20 and 21 to force the lug 21 to slide further into the slots and hence the cap 15 and the cylinder 17 are forced towards each other until the sealing cap 10 engages the coil former 6.

Figure 2 is a sectional view taken on the line II-II of Figure 1. The tube base 8 accurately fits within the screening cylinder 17. The inside of the tube base 8 is provided with a number of contact springs 9 which make contact with the conductive strips 5 which extend along the envelope of the tube. Furthermore, two fixed abutments 30 and 31 and an abutment 32 which is constructed so as to be resilient in a radial direction are present on the inside the tube base 8. The resilient abutment 32 ensures an engagement of the tube 2 against the abutments 30 and 31. The bottom portion of the tube 2 is accurately centered in this manner with respect to the tube base 8. Further means may be provided in the tube base 8 which lock the tube 2 against rotation

with respect to the coil former 6.

Figure 3 is a sectional view taken on the line III-III of Figure 1. The sealing cap 10 located in the screening cap 15 has at its inner circumference two fixed abutments 40 and 41 and an abutment 42 which is resilient in a radial direction. With these three abutments the window portion 3 of the tube 1 is accurately centered with respect to the coil former 6.

The radial position of the tube 2 with respect to the coil former 6 is fixed by the unambiguous centering of the bottom portion 4 and the window portion 3 relative to the coil former 6. The axial position of the tube 2 relative to the coil former 6 is fixed in that the window portion 3 of the tube 2 engages and is urged towards the face 11 of the sealing cap 10 by the spring 14 provided in the tube base 8. As a result of the spring 14 the position of the window 3 of the tube 2 upon expansion of the tube 2 and/or coil former 6 is also maintained. In the case of expansion the spring 14 is compressed to a greater or lesser extent while the window 3 of tube 2 remains urged against the face 11 of the sealing cap 10. As a result of this the scene to be picked up is sharply displayed on the target provided on the inside of the window. Since the tube base 8 forms one integral part with the coil former 6 the length of the pick-up unit is small, which makes the pick-up unit particularly suitable for incorporation in small portable cameras. Since the tube base 8 forms part of the coil former 6, a saving in weight of the pick-up unit also occurs. Since moreover the screening sleeve consists of two detachable parts, it is possible to replace the camera tube in a simple manner in the case of coil/tube defects in the pick-up unit.

Figure 4a shows a part of the screening sleeve to explain the coupling between the two parts hereof. The screening cap 50 has at least two outwardly bent-over lugs 51. A slot 52 is provided beside the lug 51. The screening cylinder 53 also has at least two outwardly bent-over lugs 54. Upon coupling the screening cap 50 to the screening cylinder 53 the lug 54 engages in the slot 52. By means of a ring shown in Figures 4b and 4c the lugs 51 and 54 are driven apart until the sealing cap connected in the screening cap engages the coil former partly

surrounded by the screening cylinder 53 (see also Figure 1).

Figure 4b is an elevation of the ring with which the screening cap 50 and the screening cylinder 53 are coupled. The ring 60 has two notches 61 with which the ring 60 is moved over the lugs 54 of the screening cylinder 53. The ring 60 furthermore has two wedge-like parts 62 and two abutments 63 which limit the angle over which the ring 60 can be rotated. Figure 4c shows for clarity a cross-sectional view of the ring 60. The screening cap 50 and the screening cylinder 53 can be coupled together by means of the ring 60 without either part being rotated relative to the other.

As an alternative to a sealing cap which is connected in the screening cap and which is detachably secured against the coil former it is possible, after assembly of the tube in the coil former, to connect the sealing cap to the coil former in a fixed or non-fixed manner and then to move a metal screening sleeve which is formed as one assembly over the coil former.

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**CLAIMS:**

1. A pick-up unit for a television camera comprising a camera tube having at one end a window portion and at the other end a bottom portion, said camera tube being surrounded by coils on a coil former and said camera tube being centered relative to the coil former near the window portion and near the bottom portion, characterised in that the camera tube is provided with laterally led-through contact strips adjacent its bottom portion, that a sealing cap is provided at the end of the coil former facing the window portion, that the sealing cap has an abutting surface which extends perpendicularly to the axis of the coil former and is provided with an aperture, that the sealing cap includes means for centering the window portion of the camera tube relative to the coil former, that a tube base for the camera tube is connected to or forms part of the coil former, said tube base comprising means for centering the bottom portion of the camera tube relative to the coil former, resilient means for urging the camera tube against the abutting surface of the sealing cap, and contact means for contacting the laterally led-through contact strips of the camera tube.
2. A pick-up unit as claimed in Claim 1, characterised in that the means for centering the bottom portion and the window portion of the camera tube are each formed by three abutment members which project radially inwards from the circumference of a circle and extend in an axial direction, one of said members being constructed so as to be resilient in the radial direction.
3. A pick-up unit as claimed in Claim 1 or 2, characterised in that the sealing cap is detachably connected to the coil former and is connected in a metal screening sleeve in which the coil former is fitted.
4. A pick-up unit as claimed in Claim 1, 2 or 3, characterised in that the screening sleeve consists of a first and a second cylindrical



portion, the first portion abutting against a part of the coil former the diameter of which is equal to the outside diameter of the first portion of the screening sleeve, and the second portion comprising the sealing cap, the inside diameter of which is selected so that it fits closely
5 around the outside diameter of the first portion, said first and second portions being detachably coupled together.

5. A pick-up unit as claimed in Claim 4, characterised in that the first and the second portion of the screening sleeve are coupled together by means of a ring which has at least two internal
10 wedge shaped parts extending along the direction of the circumference and increasing in the axial direction and which drive apart lugs which are connected at the facing ends of the first and the second parts to such an extent that the sealing cap connected in the first part is urged against the coil former.

15 6. A pick-up unit for a television camera substantially as described herein with reference to the accompanying drawings.

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