7. Comments by author of the translation

Here are my notes and additions to Czech translation of German written repair manual „**REPARATUR – ANLEITUNG PRAKTISIX, 190 000**“ purchased in paper form (printed copy) in May 2022 from:

https://www.camera-manual.com/praktica-(veb)-praktisix-2-a-manual-12540-eur

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In Czech version here were the author's comments on translation, but because this is separate English edition of only these notes and additions without repair manual, so I do not include them here. Only original page numbering is preserved here, for better comparison with Czech original.

I have tried to make translation as faithful as possible, but since my knowledge of (technical and normal) English is far from perfect I apologize for any faulty or unintelligible parts in translation. If anyone is bothered and would like to help me, please send a description of errors and ambiguities to my email address and I will try to fix it.

In this translation, a comma is used as a decimal separator.

Additions, reflections and notes by the author of translation:

To the cmp unit in paragraph 3.8 f on page 32 for curtain tension:

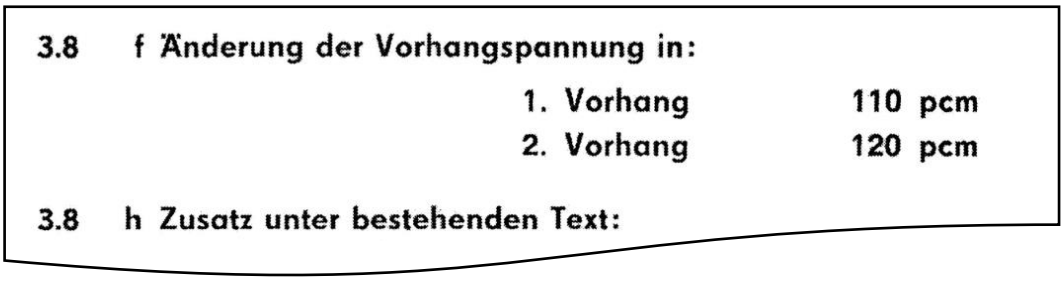
On internet I was “snooping” what cmp designation might mean. However, I found only one discussion thread on this topic:

https://www.photo.net/discuss/threads/shutter-curtain-tension-measured-as-cmp.5509358/

Here one discussant considers whether this is not torque in centimetres per unit of force pond, but he also states that torque has always been and is used in units of force per arm, such as pond/cm (without the slash pcm).

As another alternative, I was thinking it was some kind of abbreviation (German, English). I thought about the abbreviation because in the photo at paragraph 3.23 on page 39 in the Praktisix repair manual the abbreviation 8,2 klm is given, which according to the text means "Kleinstmaß von 8,2 mm" i.e. the smallest dimension 8,2 mm. However, in German I can't think of any corresponding word that starts with c or cm in written form (German language doesn't have many of those), and in English I can only think of compare, but again I have no idea what to compare with what.

Well, then I took a good look at the Praktisix II camera repair manual, German "Reparaturanleitung PRAKTISIX II 119 008" (well, it's just a description of what's different from repair manual for initial Praktisix), which I got from the same source as repair manual for Praktisix, and here in paragraph 3.8 f on page 3 of is stated curtains tension as follows **(THE FOLLOWING VALUES ARE VALID ONLY FOR PRAKTISIXES II manufactured after October 1, 1964 and are not for the initial Praktisixes !!!):**



3.8 f Änderung der Vorhangspannung in:

1. Vorhang 110 pcm
2. Vorhang 120 pcm

3.8 h Zusatz unter bestehenden Text:

this is English:

3.8 f Changing tension of curtains to:

1. curtain 110 pcm
2. curtain 120 pcm

As you can see from the picture with a scan of the original (German) paragraph 3.8 f from the Praktisix II repair manual, the unit of tension there is **pcm**, not cmp as in the other manuals that I have seen.

So, this leads me to conclude that the discussant in the above link www.photo.net..., is most likely correct in saying that it is torque expressed in ponds per centimetres of arm length. (Of course, the English repair manual for the later PENTACON Six/TL that wanders freely on the internet again specifies the unit of tension for curtains cmp, so mess is a very weak expression.)

In my opinion, the torque is measured with a torque meter, where measured torque always tries to rotate measuring sensor, and I don't know what is meant by torque measurement in paragraph 3.8 f in Praktisix repair manual, where it says that is measured the tension (original German word Spannung from the word spannen = to stretch, to spring) of both curtains on their metal edges placed in middle of the picture window. This tension is to be measured with a tongue scales (German Zungenwaage, i.e. a general term for any scales with a tongue showing balance) in the direction of tension of curtains, so it is quite clearly to be measured in straight direction and not the torque, so in my opinion measurement would in this case change to just a force measurement, now in Newtons (N).

Conversion is: 1 pond = 0,00980665 N

Thus, if the so-called normal gravitational acceleration at 45° latitude at sea level is considered, this is 9,80665 m/s^2. More precisely, the acceleration of gravity in Brno is 9,81275 m/s^2, in Prague 9,81373 m/s^2 and in Ostrava 9,81345 m/s^2 (according to Wikipedia). However, the differences are so small that they "hide" in uncertainties and are not worth dealing with.

Because I have a simpler torque meter (it is a torque screwdriver from China) with a range of 0,05 – 0,5 Nm (Newton meter) and an uncertainty of ±2%, labelled ANSRS-0.5 at the time of writing, available on Alibaba at the link: torque screwdriver from Alibaba , looking like this:

I was thinking how to measure this, and I thought that if I mounted a 15 cm long arm to the hexagon bit of the screwdriver (on both sides for balance), it would be possible to measure this with the screwdriver range, so in the following table I give the values measured in force (weight) grams and the values for the torque measured on the 15 cm long arm.

	Prescribed value v pcm	Value in force (weight) grams	Torque on 15 cm arm in Nm
1. curtain	120	120	0,1765
2. curtain	140	140	0,2059

To verify the conversion to torque I found a “pretty edible” (sorry for this mine slang) converter of all sorts to:

https://www.translatorscafe.com/unit-converter/en-US/moment-of-force/8-1/

this link is already preset to open for torque conversion. In field "From:" unit "gram-force centimetre" will be selected, that is converting from force grams to centimetre (force gram = pond) and is inserted there value prescribed times the length of the arm it acts on in cm (all inputs is in centimetres) and in field "To:" unit "newton meter" will be selected (in this unit measuring screwdriver), then calculation for 1st curtain, thus for 120 pcm on a 15 cm arm will be:

120 pcm * 15 cm= 1800 gram-force centimetre

value 1800 is inserted into field „From:“ and in field „To:“ will be 0,1765197 Nm.

I verified this by measuring tension of second curtain on a Pentacon six I bought in a non-functional state (for repairs). I measured tension with the ANSRS-0,5 torque screwdriver mentioned above (range 0,05 - 0,5 Nm), and with a 15 cm arm mounted on it. I measured immediately after disassembling the camera, without any changes to it. I measured an average value of 0,165 Nm on the 15 cm arm, which after conversion corresponds to 112,2 pond/cm, rounded. Second curtain of Pentacon six is supposed to have 120 pond/cm according to its repair manual (the manual says cmp), and I consider this a very good match, since camera is older, not cleaned at time of measurement, and springs may be "tired".

The formula for converting the value from the manual in pond/cm to torque in Nm is:

$$torque\ [N/m] = value\ [pond/cm] * (length\ of\ arm\ in\ cm) *\ 0{,}01 * 0{,}00980665$$

The back-calculation of the measured torque is according to the formula:

$$value\ from\ manual\ [pond/cm] = \frac{measured\ torque\ [N/m]}{(length\ of\ arm\ in\ cm)\ *\ 0{,}01 * 0{,}00980665}$$

where:

0,01	=	centimetres to metres conversion
0,00980665	=	is conversion between pond and N, so 1 pond = 0.00980665 N, considering so-called normal gravitational acceleration, which is 9,80665 m/s^2

and in case of measured value, it will be:

$$\frac{0{,}165}{15 * 0{,}01 * 0{,}00980665} \doteq\ 112{,}2\ pond/cm$$

To adjusting of film transport, in manual paragraphs 3.31a to 3.31b:

For setting or checking step by which film is moved, this manual uses special gauge L 1742. Since I have not been able to find anything about it on Internet (despite a lot of snooping) and I have not seen anyone selling it anywhere, I am recommending the procedure for setting of film step from Praktisix II camera repair manual (supplement to the manual), in German "Reparaturanleitung PRAKTISIX II 119 008", from paragraphs 3.31a to 3.31b. There, a complete film is used for this, on which the position of the picture window is outlined through lens mounting hole at time B after each film advance. Although this will destroy film, but it is a fairly simple method, and more importantly, it is easily available today.

For Praktisixes the film MUST be complete, so NOT just an empty covering paper !! This is because Praktisixes move film ONLY depending on frame counter (changes number of turns of winding spool) and do not measure displacement of transported film like newer Pentacon six and Pentacon six TL (for these, use of empty covering paper is possible), so using just empty covering paper would make its diameter reduced, compared to the one with film, which would lead to erroneous results - empty cover paper moves a smaller distance and hence overlapping of images on it. To add to this, today's films and their cover papers are thinner than they were when Praktisixes were designed, so even with feed set correctly according to films of the time, the images are closer together, and the Praktisixes can allow up to 13 frames per film, but the last images may already be touching, or even overlapping a bit.

You can also use some destroyed developed film to check transport, which is glued to empty covering paper again in right place, but it is necessary to wind it carefully so that does not bulge, because film is wounding from its unglued end. Perhaps a better procedure is to measure and mark location of end of film on covering paper, wind unglued film and then, if beginning of film comes out in right place, only glue it to cover paper and if beginning does not come out in right place, there is a possibility of correcting transport of film.

Description of the slow-speed (timing) mechanism:

Since I haven't (yet) found any description of operation of the timing mechanism anywhere and I think understanding its operation is for repairing and especially adjusting shutter speeds quite important, I will try to write something about it here. The description is based on my experience in repairing (so far only one) Pentacon six, which I bought in quite nice condition but with a non-functioning shutter. Shutter somehow worked for 1/1000 (it was circa 1/400), for 1/500 to 1/125 it always stayed open (2nd curtain did not run), for longer times 2nd curtain did not run only sometimes, quite exceptionally. If second curtain did run, it usually ended up running so that metal beginning of curtain was all visible near left edge of picture window, so I guess it would let light onto film there. I have placed this description in repair manual for Praktisix because timing mechanism (Hemmwerk in German) has undergone only minor changes in terms of its operation during production from earliest Praktisixes to latest Pentacon six TL. The timing machine is located below the timing dial, on left side (left is in syntax of this Praktisix "Repair Manual").

Because (in my opinion) the description of the individual parts in the "Repair Manual" is not completely clear and simple, I am putting here some pictures of the timing mechanism (the black and white one is from the Pentacon six repair manual, because it seemed better to me, and I have taken the liberty to take another colour photos, it is also a Pentacon six) with the numbers indicating the individual parts, which will be discussed later.

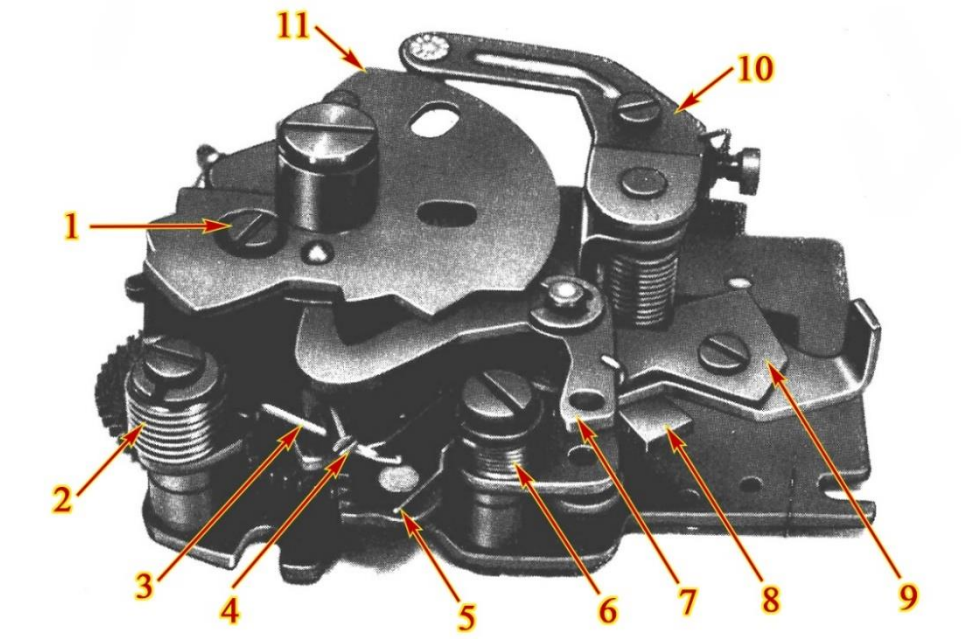


Fig. 1: Timing machine (Hemmwerk) from the Pentacon six repair manual

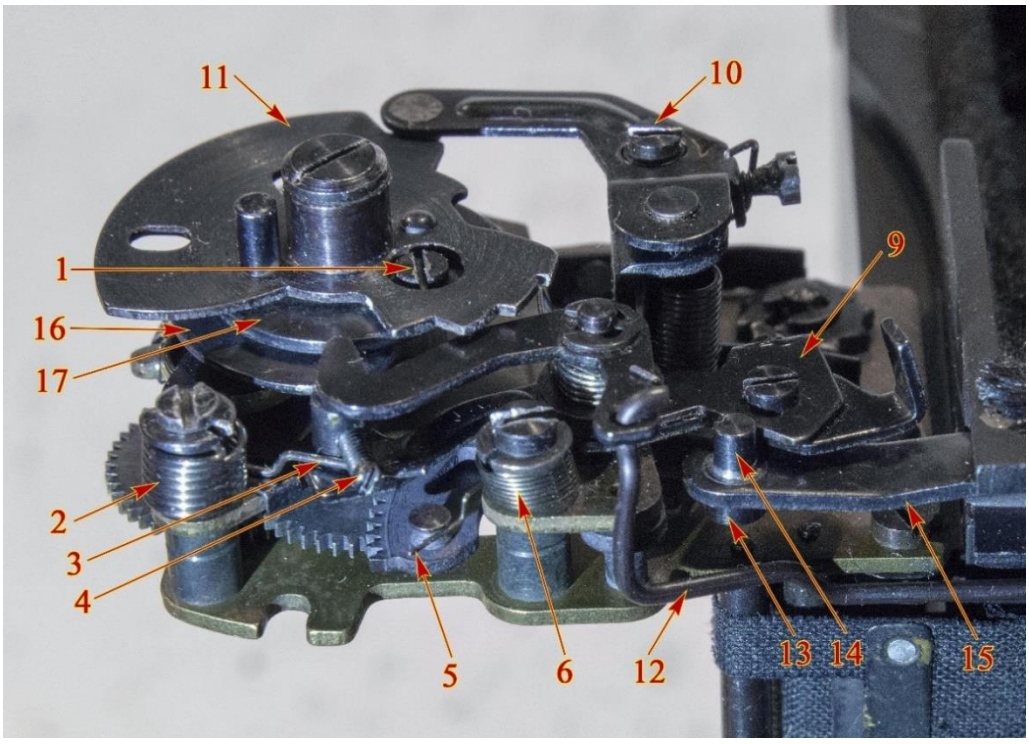


Fig. 2: Pentacon six timing machine mounted on gear support (set to 1/60)

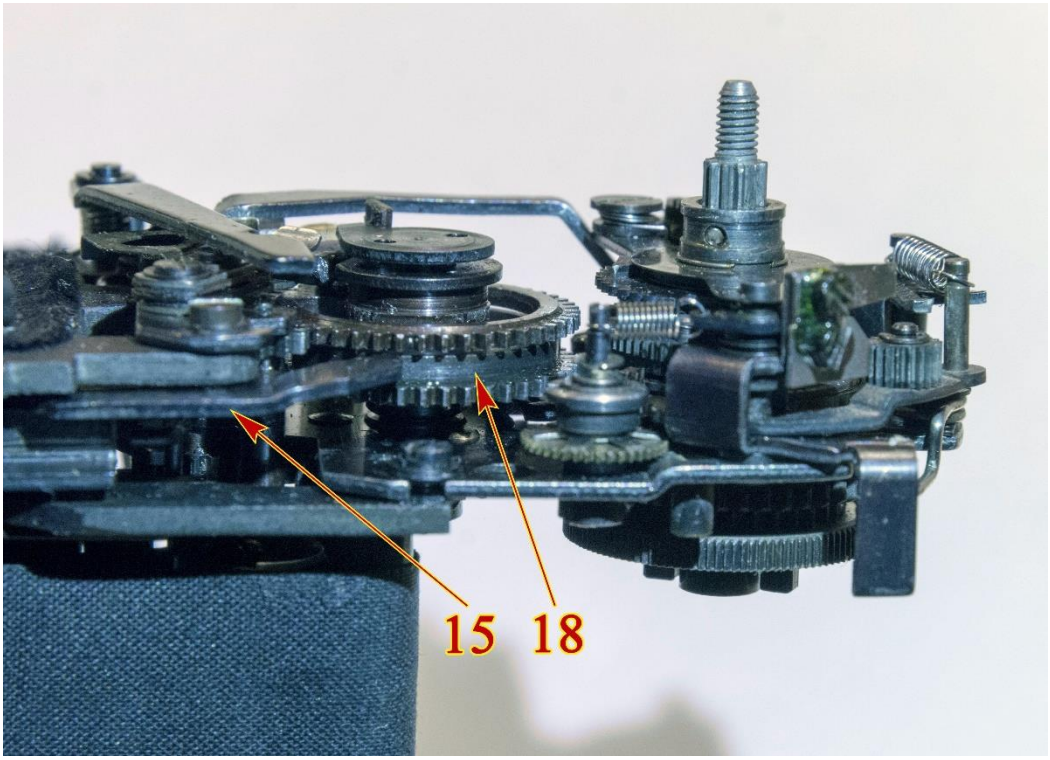


Fig 3: Shutter mechanism (with numbers) and film transport mechanism of Pentacon six

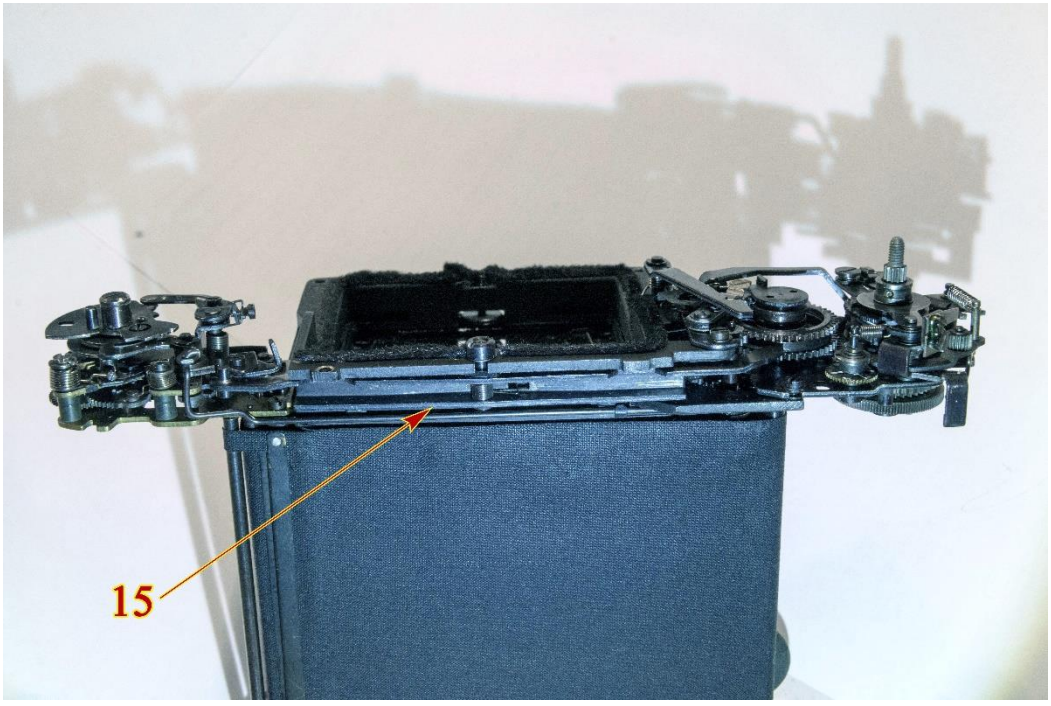


Fig 4: Overall view of Pentacon six mechanisms

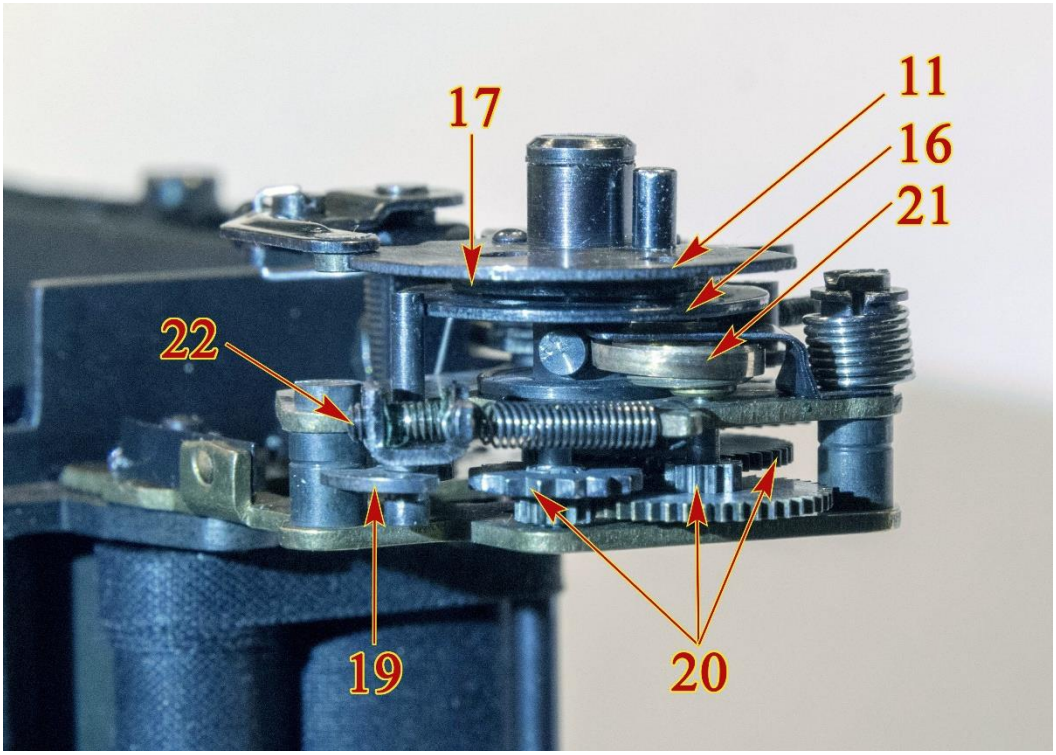


Fig 5: View of time machine of Pentacon six from the gear wheels, anchor and flat coil (clock) spring side

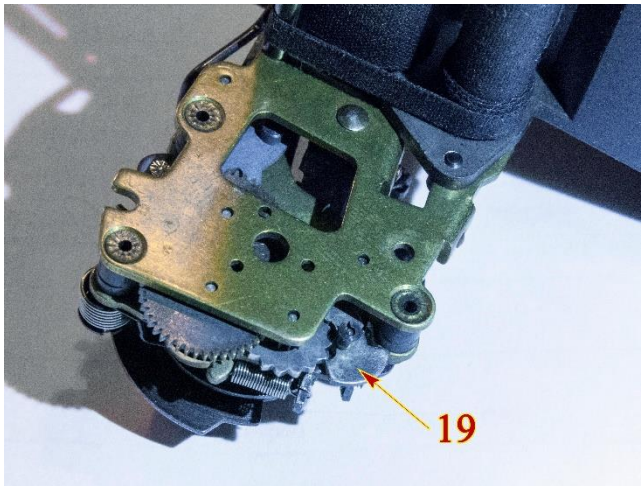


Fig. 6: View of anchor 19 in take

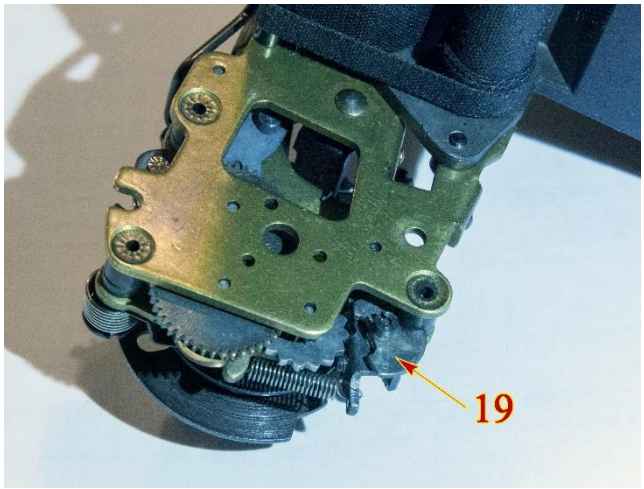


Fig 7: View of anchor 19 out of take

Where numbers denote (they are not all in each picture):

1 – screw with square nut for 1/250 adjustment

2 – spring **(-4002)** for setting 1/500 (set by turning upper slotted nut while loosening screw on it - there was a special wrench for this)

3 – arm of spring 2, which acts on the end of lever of short times

4 – adjustment screw for 1/125 adjustment

5 – arm of spring 6, which acts on the end of toothed segment of long times

6 – spring **(-4001)** for tuning 1/60 as well as of long times

7 – lever **(-4009)** for controlling rod of B time (it is controlled by second speed curve from above)

8 – end of toothed segment **(G 47)** of long times, which acts on the speed lever **(G 35)**. This lever controls triggering of second curtain in mechanism on right side of the camera.

9 – lever of short times **(G 43)**, on its upper side you can see screw which according to manual is locking inclination of adjustment bar for time 1/125

10 – lever of long times **(G 45)**

11 – group of time cams **(G 41)**, arrow points to upper cam for the long times

12 – rod **(-2004)** for operating of B time

13 – lower cylindrical pin of time lever **(G 35)**, which controls long times

14 – upper cylindrical pin of time lever **(G 35)**, which controls short times

15 – time lever **(G 35)**, it is controlled by time machine and for the time specified by time machine blocks start of running of 2nd curtain

16 – lowermost cam, which connects and disconnects of time machine anchor from take.

17 – middle cam, is controlling (except 1/250, which has its own stop) short times and rod for B time

18 – gear wheel **(G 93)**, which controls lowering of 2nd curtain by having a kind of cylindrical part with a hole (arrow 18 points to cylindrical part, but hole is not visible in photo), into which time lever **(G 35)** fits, thus blocking it and thus second curtain

19 – anchor (whole anchor assembly has number **G 49**), slows down time machine for times 1/15 to 1 second, for others times it is out of take

20 – time machine gear wheels

21 – flat coil (clock) spring **(G 42)**

22 – cylindrical grooved headless screw that adjusts depth of engagement of anchor in gear wheel

Part numbers, in bold and in brackets, are for Praktisix, although all pictures show Pentacon six, and some of its parts are slightly changed, e.g., the time lever G 35 is called -35.00 from the Praktisix II and looks slightly different, but its function is the same. However, I'm using Praktisix parts designation here. Numerical designations written without brackets and not in bold are my part designations from pictures above.

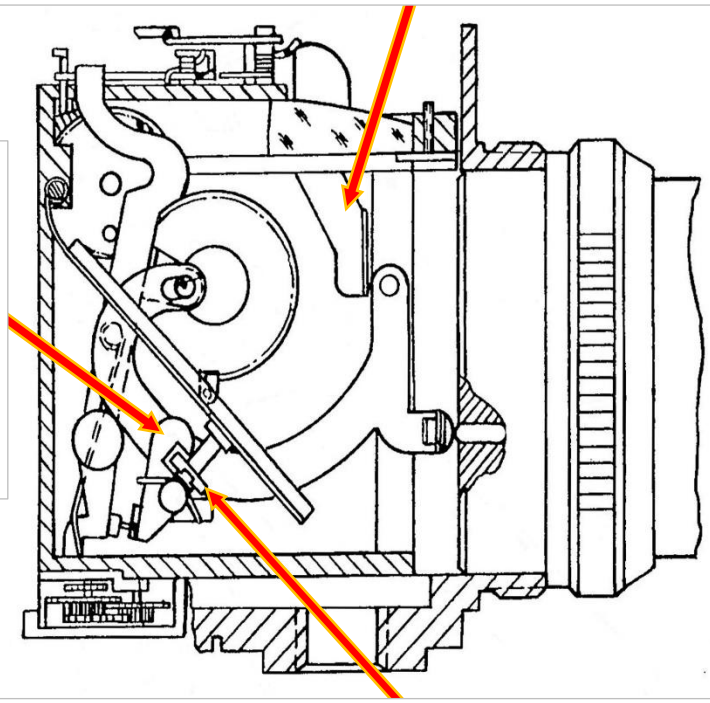
To begin with (in my opinion) an important note: before adjusting shutter speeds, whole mechanism should be thoroughly cleaned of dried and solidified old lubricants and some parts (see "Repair manual") should be properly lubricated. However, do not lubricate gear wheals 20 of time machine and gear wheels of the self-timer, or the clock spring 21. Lubrication of gear wheels would only cause unwanted braking and, in the case of clock spring 21, pasting of its threads.

A note on timing curves 11, 16 and 17: when viewing at repair manuals, it seemed to me that there was only one. However, after disassembling camera, I found that there are three joined curves on top of each other. Highest 11 and visible from above in the manual controls the long times lever 10, the middle 17 controls the short times (1/500 to 1/125) and the bottommost 16 "just" engages deceleration anchor 19 of time machine for times 1/15 to 1 second.

Brief description of shutter release sequence: pressing shutter release button releases the mirror, which is held in down position by a latch holding a circular slotted nut located on a screw on underside of mirror base. The nut is also used to adjust position of mirror in cocked position so that elevation of image in viewfinder matches position of image on film. Only when mirror reaches top position does projection on right side of its base release two toothed shutter wheels via another lever. For a closer look at process described, see following transparency drawing:

Lever that mirrors base uses to release shutter when the mirror is flipped upwards.

A latch which, when trigger is pressed, turns its upper end to left (in sense of this picture) to release circular nut and thus base of mirror.

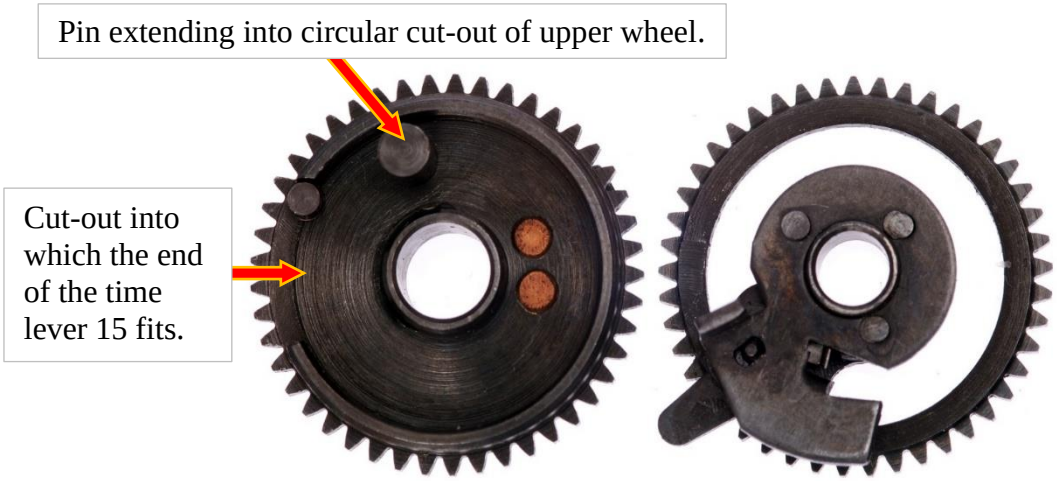


Circular nut, used, among others, for adjusting angle of mirror in cocked position.

The circular nut and latch are visible through lens opening when shutter is not cocked, they are (when viewed through lens opening and with viewfinder upwards) on left side of mirror chamber. But circular nut is at top, at base of mirror. So, you can adjust tilt of mirror base without disassembling camera by comparing images in viewfinder and on additional second focusing screen placed in place of film, it will just be a method of several attempts.

Lever holding top toothed wheel of first curtain (triggered by mirror base) and wheel are shown in pictures A and B here in section "My findings from setting up the Pentacon six and adjusting times:/ About rewind mechanism:". Top wheel that controls first curtain also includes curtain run braking segment, labelled B in the pictures. Upper wheel has a circular groove inside most of its circumference in which cylindrical pin from second wheel controlling second curtain, shown in Fig. B can be seen next to the run-out braking segment of first shutter as it rests on its stop. Its resting on this stop also determines the gap between curtains when shutter is cocked and thus determining time of 1/1000 sec.

Upper part of lever which is operated by mirror and thus triggers shutter can be seen in both pictures right next to mirror chamber, in picture A it is below line of arrow with letter A. It will be seen that the lever holds in its cocked state by its tooth the stop of bent end of the braking segment B of upper wheel, and this in turn holds with end of its circular cut-out cylindrical pin of toothed wheel of second curtain. For convenience of illustration, here is photo of two dismounted toothed wheels:



Lower gear wheel 93.00 (on left, without circular cut-out) and upper gear wheel 92.00 of Pentacon Six gearbox - in this case both with 45 teeth.

When the mirror reaches top of mirror chamber and thus releases this lever, toothed wheel of first curtain (and with it first curtain) immediately starts to run, upper wheel releases pin of lower toothed wheel of second curtain, which can also start to run. However, toothed wheel of second curtain still has a cylindrical part around its circumference with a cut-out, marked 18 in figure 3 (cut-out is not visible in figure 3, because shutter has not been cocked), into which time lever 15 engages when cocked, and thus (with exception of 1/1000 s) it delays the start of second curtain. Time lever 15 leads through back of camera (above the film plane, next to focusing screen) from right to left side, what bring he transmits control of second shutter curtain release to so-called time machine (Hemmwerk in German). He does this, after shutter has been triggered, it blocks the second curtain from running for required time via time lever 15 by holding time lever 15 in cut-out of lower toothed wheel. However, lower wheel is already unlocked, so it pushes time lever 15 out of cut-out (its end fitting into cut-out is angled) against force of time machine. Setting of time lever (depth of insertion into mechanism holder in which it is held by screw) affects shutter times, so I recommend keeping a lever clearance of about 0.2 mm between second curtain wheel 18 and time machine segment, as described in Praktisix manual in paragraph 3.9 and in Pentacon six manual in paragraph 3.3.8.

Comparison of pictures visible in viewfinder and on the film: nowhere could I find what part of film window is displayed in viewfinder. I only found information about angle of tilted mirror, in paragraph 3.4.1 of Praktisix Repair Manual and in paragraph 3.3.3 of Pentacon Repair Manual - angle is 46°30' and is always the same. Also, nowhere did I find any information of picture area visible in viewfinders - that is how much smaller it is than picture window on film. So I had no choice but to document it myself, and I am posting two photos here, (both are inverted so that pictures on focusing screens are sideways correct)**:**

Image on left is a photo of focusing screen inserted in film plane, it is whole picture window as it appears on the film. Larger box drawn with a red white solid line approximately shows image area visible on focusing screen without any additional attachments. Focusing screen (in this case a flat one with wedges, bought via eBay from Kiev) is pictured on right, and you can see in upper right corner that area is somewhat restricted by hardwire frame holding focusing screen in viewfinder, with a bit of image shining through in upper right corner between hardwire frame and edge of image chamber. Smaller frame drawn with green white dashed line is image visible in prismatic viewfinder (in this case image was observed through prism without TTL measurement).

From both pictures it appears that area visible in viewfinders is much smaller than it is on the film, for focusing screen I estimate to be about 75% of film window area and for prisms even less (they are inserted into light shaft), which seems quite small to me. In addition, areas shown in viewfinders are located pretty close to the bottom edge of film window. This placement bothered me when I was testing my Pentacon six, we were shooting portraits with it, excessive to say, and they have a much larger top edge on the film, which bothered photographer who was shooting this, because she didn't compose image that way. Of course, this can be easily removed by cropping during processing, but it takes away part of image...

I did tests on both cameras I have (Praktisix and Pentacon six) and on both cut-out visible in viewfinders is positioned equally at bottom. Because mirrors were set to an angle of 46°30' from vertical plane of film (my assumption), so the lowest end of mirror (near lens) is raised up and image on focusing screen is shifted down closer to plane of film versus when the mirror would be at a 45° angle. But I don't know how focusing screen is positioned above mirror, it may be centred (determined by camera design) on both angles. So, is this a mistake or by design? I will have to leave up to everyone think it over and eventually adjust by circular nut described above as they see fit.

Description of time machine functions: time machine via time lever 15, that is, by means thereof, controls delay of 2nd curtain behind first curtain four ways:

1) **For time of 1/1000 s:** time mechanism is completely discarded and time is determined by speed of curtains, and secondly, and most importantly, by width of slit, which is already set when the shutter is cocked (1.7 - 2.0 mm after cocked). However, because speed of slit is not constant during run across picture window – curtains accelerate and also wind up to an increasing diameter – their speed increases. A constant slit under these conditions would lead to uneven exposure, with time at end of run being significantly shorter than at beginning. So, it's done in such a way that width of slit increases during its run (probably by winding to different diameters), which compensates for effect of increasing curtains speed.
2) **For times from 1/500 to 1/125 s:** lever of long times 10 is held out of take-up by upper speed curve 11 (that is, disengaged, including 1/1000). These times are slowed down by upper pin 14 on left side of time lever 15, which glides on slant of lever of short times 9 and slope of its inclined part can be changed by two screws on lever of short times 9, thus changing braking force. Braking force is generated by spring 2, prestressing of which is adjustable. Individual times are controlled by a second (from above) speed curve 17 as follows:

   For 1/500 there is no possibility to change track length, time is set by changing prestressing of spring 2. This is done with a special wrench **(A 1271)** that allowed upper slotted nut to be turned while simultaneously loosening screw that locks it.

   For 1/250 is attached sliding stop to the speed curve by screw 1, position of which (screw is in longitudinal groove) is controlled length of track on which this mechanism will act and thus time.

   For 1/125 there is a special adjustment screw 4 on lever of short times 9, which, as in previous case, controls length of action path (for 1/125 path is of course longest). The 1/125 time, according to instructions, is also supposed to be controlled by inclination of end of lever of short times 9, but this inclination, in my opinion, also affect shorter times (1/500 and 1/250) as well, so recheck these times after adjusting inclination.
3) **For times 1/60, 1/30 and flash:** lever of short times 9 is held by second speed curve 17 from top out of take. These times are regulated by lever of long times 10 running along on the uppermost speed curve 11. Lever 10 controls so-called clockwork via toothed section 8. Toothed section 8 controls by its end (in Figure 1, this end is pointed to by arrow with number 8) lower pin 13 of time lever 15. Time lever 15 blocks second curtain from running until running of timing mechanism has finished and time lever releases second curtain.

   Clockwork consists of a number of toothed wheels 20, one of which is connected to clock spring 21 and last of which has triangular teeth into which anchor 19 optionally fits, which oscillates back and forth around its axis, thus braking clockwork. In the case of times 1/60 to flash, however, this anchor is disengaged by means of a third (from above) speed curve 16. Clockwork is braked by two springs during its working operation: firstly, a so-called clock spring which is made of a flat coiled (probably bronze) strip 21 and secondly by coiled spring 6 pressing its end 5 against pin of toothed section 8 over which clockwork is connected. Clock spring 21 is built-in fixed, nothing can be adjusted on it, but it is necessary that it is not lubricated, and there is no residue of some

old, for example condensed lubricant on it, because it can cause gluing of its threads and thus a significant change in its properties. If it is already lubricated, it is absolutely necessary to wash it in technical benzine or something similar and dry it so that its threads do not glue together. Coiled spring 6 is of the same design as spring 2 acting on lever of short times 9, but is of thinner wire and is regulated in the same way as spring 2.

These times cannot be set individually, setting should be done in such a way that after setting 1/125, time of 1 second should be set by prestressing of spring 2, and then 1/60 and all remaining long times should be adjusting by lever of long times 10. Regulation of these times is again based on principle of different running paths, for 1/60 path is the shortest, for flash the longest, their graduation is fixed defined by speed curve 11 and cannot be changed.

It is adjusted by means of two screws that are on top of lever of long times 10: screw that is screwed from top is locking, when it is loosened it is changes setting of the lever, and screw that is horizontally is just a stop, which needs to be pushed manually on moving part, there is no spring pushing there.

4) **For times 1/15 to 1 second:** the lever of short times 9 is again held by the second (from the top) speed curve 17 out of take. These times are also regulated by lever of long times 10 running on uppermost speed curve 11 and controlling so called clockwork via toothed section 8. Toothed section 8 also controls by its end (in Fig. 1 this end is pointed to by arrow with number 8) lower pin 13 of time lever 15, as in the case of times 1/60 to flash.

The change is that for these times, third (from the top) speed curve 16 puts the anchor of clockwork 19 into the take, which slows clockworks movement down a lot more. The times are in turn determined by graduation of upper speed curve 11 and, apart from settings described here in 3), there is no way of affecting each of them separately.

In Figure 6, anchor 19 is photographed when it is in shot in triangular-toothed wheel, this is position for times 1/15 to 1 second. In figure 7 anchor is extended out of tooth gear take, this is for all other times.

My observations from disassembling Pentacon six and adjusting times:

To prestress the curtains in paragraphs 3.8 c (Praktisix) and 3.3.7 (Pentacon six):

Prestressing curtains by three turns gave me a tension of only 68 cmp (0.10 Nm measured on a 15 cm arm) for Pentacon six described above, so I had to add, for example for 2nd curtain, about 6 turns in total. There are a couple of questions: firstly, whether it is not springs fatigue, camera is no longer the latest, and secondly, if it is springs fatigue, how many more revolutions can be prestressed before they stop springing and when overstressing, there would be a risk of damaging or breaking spring. Of course, I don't know how much springs can be overstressed (how many revolutions they can take without affecting their function), so be very careful with this one.

To adjusting 1/1000 s in paragraphs 3.25 (Praktisix) and 3.4.5 (Pentacon six):

By changing pre-tensioning of curtain springs, this time can be adjusted within some small limits; this should have an effect on speed of individual curtains run. However, to achieve a larger change of 1/1000 on my camera, I had to reduce preset slit between curtains in cocked state to a value of (I estimate) about 1 mm. As I describe in note at end

of paragraph 3.8 h, I reduced slit by under gluing hauling strips of first curtain on winding roller with self-adhesive paper (descriptive self-adhesive labels).

To adjusting 1/250 s in paragraphs 3.25 (Praktisix) and 3.4.5 (Pentacon six):

When adjusting 1/250 be careful of position of nut under adjusting screw 1, after tightening it must be its outer circumference (it is a kind of perhaps circular section) everywhere about the same distance from template above it. Unequal distances (if mother is rotated somehow, it is possible, clearance is there, that is on Pentacons, on Praktisixes I don't know) will cause 1/250 to be different even within some small angle around correct position. On Pentacons, correct position of time selector is snaping-on admittedly, but since I have no idea where it snaps into in disassembled state, it could be that this would have to be readjusted after build. On Praktisixes, which don't have a time selector snap, time would change depending on its position.

To adjusting 1/60 s and 1/15 s in paras. 3.25 (Praktisix) and 3.4.5 (Pentacon six):

Here I have to point out one characteristic that surprised me quite a bit. After experience with adjusting inclination of the lever of short times 9 (also there are two screws for this purpose), I loosened both similar screws on lever 10 and unscrewed them on stop. Well, while adjusting the 1/60 time to be as short as possible (I had it too long), it happened that toothed section, which controls by its end 8 lower pin 13 of time lever 15, was already too protruded, to such an extent that even though should have been out of the shot in the case of short times it wasn't. This caused the time lever to come too close to wheel 18 controlling 2nd curtain on other side of camera and to rub on its cylindrical smooth part (arrow 18 in Fig. 3 points to it), so that it impeded the run of second curtain and instead of about 1/700 (as best I could set it at that moment) time was somewhere around 1/300. I looked at it pretty dumb for a while before I discovered what was happening.

So, I strongly recommend that after changing setting of lever of long times 10, check with time setting 1/1000 that time lever 15 has prescribed clearance. And if it doesn't, then revert setting of the long times lever 10, because you just can't go any further.

When setting 1/60 and 1/15 with screw on top of lever of the long times 10, it happened to me that I could not set 1/60 (it was about only 1/30), so I sniffed again until I sniffed out following: at a certain setting and running 1/60, time lever 15 reached with its upper pin 14 up to lever of short times 9, which caused this deceleration. So, also after changing setting of lever of short times 9 with its screws, it is necessary to check if there is at least a little clearance between upper pin 14 of time lever 15 and sliding surface of lever of short times 9 when shutter is not cocked, and if not, to adjust it. I've had better luck with changing setting of the short times lever 9, even at cost of having to re-set times 1/500 to 1/125 afterwards. So, readjusting both levers need to be looked after.

Times 1/60 and 1/15 are very much interrelated when set by screws on lever of long times 10, I have not been able to set these times so that they are at least within tolerances according to table in paragraph 3.35. When was somehow set 1/60, instead of 1/15 was something in range of about 1/100 to 1/200, and even 1/8 was quite a bit shorter. When I set 1/15 (to about 1/12, I couldn't do better, it's very sensitive) was only about 1/40 to 1/44 instead of 1/60, so I don't know what to do yet. Time machine is probably more braked or something, I've removed it from carrier and degreased it properly, but didn't dissemble it for parts. Finally, I disengaged end of slowing spring 5 out of take, but no significant change. (When I first disassembled the camera, this spring was out of take, I just don't know if it was intentional, or if it was set to such a small tension that it popped out on its own...)

To the film transport mechanism:

I can't say much about the transport mechanism of the film, I did not disassemble it, but I have some knowledge.

When repairing shutter, I first cleaned both mechanisms. Since I didn't want to disassemble mechanism at first (I eventually disassembled and washed time machine anyway, but I didn't disassemble second mechanism), I first cleaned both halves of mechanisms mounted on carrier by soaking them in clean technical benzine so as not to soak curtains. Then I repeated soaking in a toluene cleaner (it's normally available to buy, but because of sniffers it's some mixture with benzine or something). Well, after that I spent some time with the shutter and didn't do anything with film transport mechanism, that is, except cocking shutter. Then I decided, that I couldn't do much more with shutter, I put a blank film paper in partially assembled camera and tried to "click" twelve pictures, then I opened back door and thought paper would be somewhere between 11th and 12th picture, but it noooooo, it was somewhere between 7th and 8th picture, pictures would overlap a lot. But before I disassembled camera, I tried film transport (of empty cover paper) by method of drawing edges of picture window on cover paper at time B, and at that time 13 pictures fit on film without any problems with still satisfactory spacing. So I sniffed what it could be but I didn't want to disassemble it again. Finally, I lubricated film transport mechanism with a mixture of fine oil and technical benzine in a ratio of 1 : 20 as instructions say and it seems to have helped. I guess mechanism was dry after cleaning, or there was some uncleaned residue left, or a lacquer used to lock screws had dissolved a bit and then solidified where it shouldn't have, I don't know.

However, without disassembling it, I have not been able to figure out how film transport mechanism works in detail, I only know what I observed when looking from above at carrier built into camera body. To illustrate what I know, I am posting two photos here:

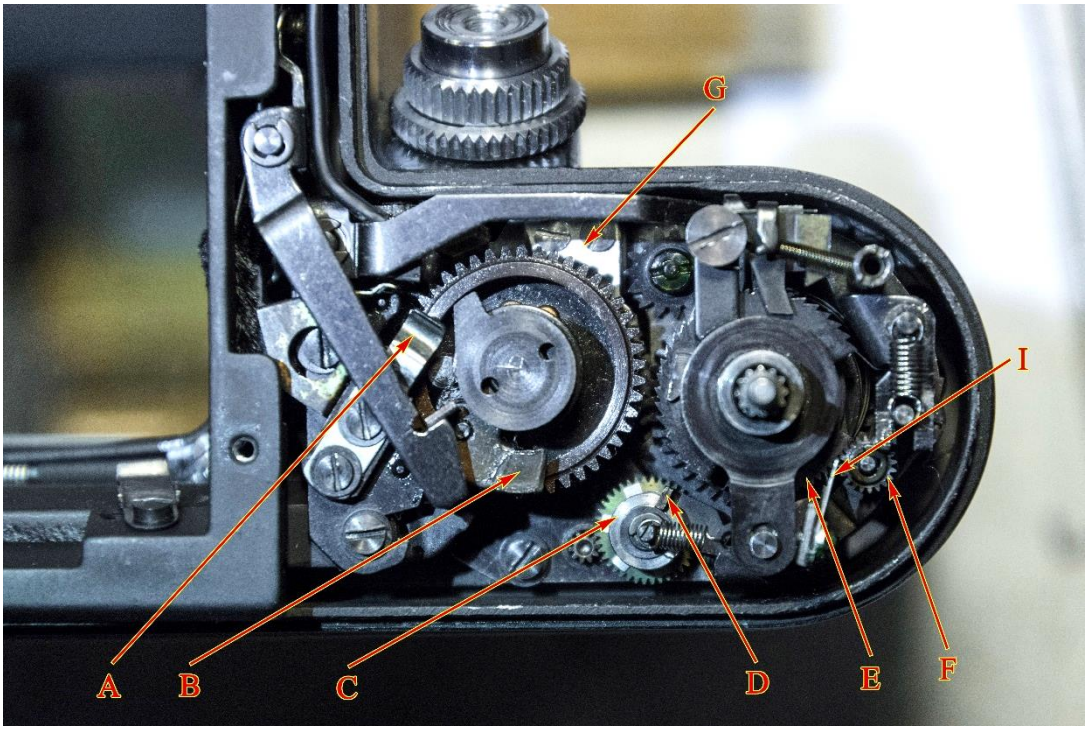


Fig. A: state after the shutter cocking and film rewinding (empty cover paper is loaded).

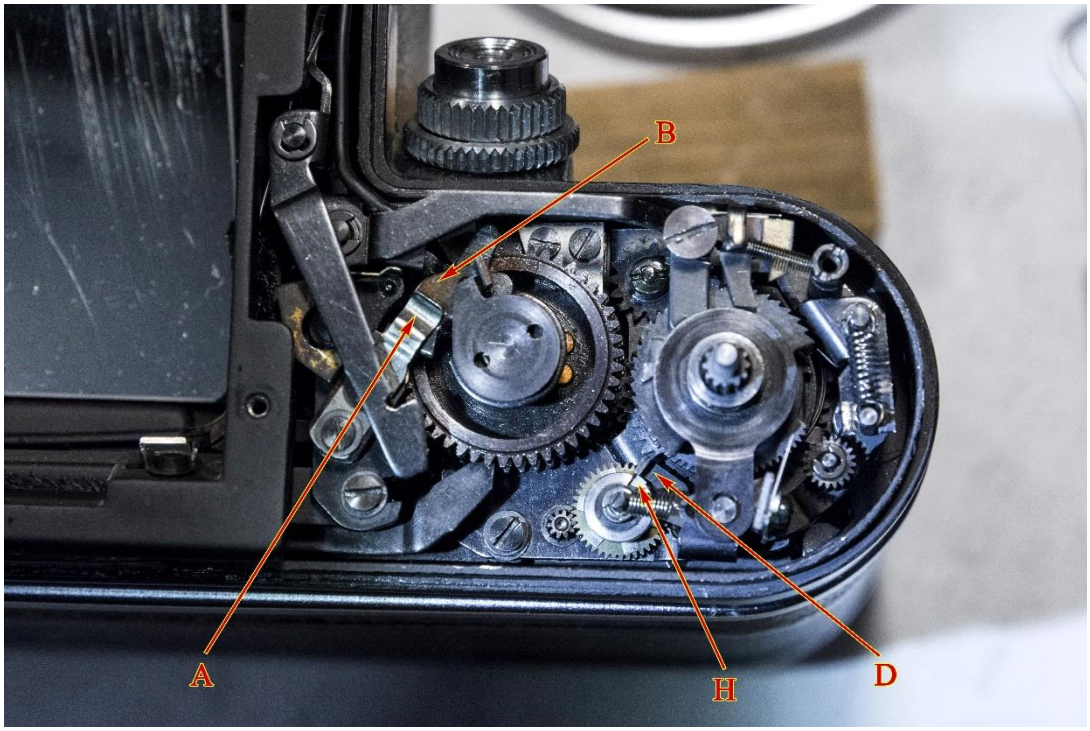


Fig. B: state after exposure, film and shutter stretching were not moved.

To figure A, when was stretched shutter and film rewound, before exposition:

Here you can see the correct position of stop D in measuring gear C for measuring length of transported film. The stop must be snapped in notch. With bad rewinding I mentioned above (position between 7 and 8 pictures after 12 exposures), it very often happened that wheel C was not turned enough and therefore stop D was not snapped in notch. As I don't know workings of rewind mechanism in detail, I can't describe here what it was, but this is how it manifested itself and lubrication described above seems to have helped (at least for now, until the oil dries?).

You can also see position of toothed wheel F, which is on lever connected to latch D and controlled by trigger button. When latch D snaps into notch in wheel C, wheel F engages with the teeth in toothed circular section E and also in smaller toothed circular section below section E (I don't know if it always or only sometimes or ever though, smaller circular section is not visible in picture). Detailed function of this again escapes me, however it will probably somehow disengage clutch to stop film transport from continuing, when its correct length has been transported.

Furthermore, you can also see braking segment of first curtain B, which I have lubricated a bit of petroleum jelly for smoother operation. When first curtain is coming to a stop, this segment must snap into brake spring A. Braking segment of second curtain is not visible here, it is located under toothed gear, only attachment of its braking springs G is visible.

Now, a few digressions:

My Pentacon six has serial number 10 298, which according to the websites:

https://www.pentaconsix.com/37serial.htm

indicates a production date sometime in August or September 1968 (months are estimated by linear interpolation of total number of units produced in 1968, so only very approximately). However, it is already equipped with a safety H with a spring to prevent latch D from snapping back again when pulled out of notch in wheel C, which acc. to:

https://zeissikonveb.de/start/kameras/praktina_praktisix.html

part "**6. Der restliche Werdegang der Praktisix**" (The rest of Praktisix career) was standard in production only from serial number 15 500 (from this serial number designation "Pentacon six TL" was also introduced instead of "Pentacon six"), and for cameras with serial numbers between 13 000 and 15 500 new wheel could only be replaced in service workshops, whereas for cameras with serial numbers less than 13 000 entire gearbox had to be replaced, which was said to be quite an expensive rebuild. So, cameras with serial numbers less than 15 500 had only a blank slot in wheel C as standard. Well, I guess someone had gearbox replaced on this piece of mine, for which I thank them.

Two pictures from Marco Kröger's article, showing a wheel without safety (left, up to Pentacon six serial number 15 500) and with safety (right, from 15 500 upwards):


On left is old wheel without additional lever, on right after replacing it with aforementioned lever with spring, which effectively prevents main lever from sinking back into gap in wheel.

Note: article "**Kleinbild oder 6x6?**" from chapter "**Kameras\Praktina und Praktisix**" on website https://zeissikonveb.de/, from which information about the spring fuse comes, I like it very much, it is quite informative reading and I thank Marco Kröger very much for it, only it is (a bit surprisingly) in German.

Another digression for overlaying images:

According to Mr. Václav Vait, small spaces or overlapping images are prevented by holding trigger down at start of rewinding, which causes latch D to be pulled out of notch and wheel C to rotate so that latch D can no longer fall back into the notch, thus allowing measuring wheel C to rotate correctly. Mr. Václav Vait describes this problem with Pentacon six quite nicely in a discussion on (but only he – you need to search for his posts in this discussion, but they are only in Czech, sorry):

http://www.temnakomora.cz/...inserting film into Pentacon six

and I have one small comment: according to article "**Kleinbild oder 6x6?**" described here above, H safety spring in question was fitted as standard to Praktisixes from serial number 15,500 onwards, so would that mean that previous Pentacon six, that produced from beginning of their production in 1966 until about February 1969, that is, and total of about 15,000 cameras was produced without this safety spring, they transported film with small spaces or even with images overlapping? Although there were certainly problems with this in these cameras (that's why the H safety was added), I don't want to believe that they did it very often or almost all the time, but then again, in that GDR at that time probably anything was possible...

Mr. Vait in above mentioned link draws attention to another (double) spring, which is marked here in Figure A with letter I. The arrow in Figure A points to its thicker upper part, which locks frames counter in top cover of camera. If you look closely at picture (or enlarge it), you can see thinner curved end of lower part of spring peeking out a little beyond the arrow, as it snaps into teeth of toothed segment E. Spring is intended to block unwanted movements of segment E in this way. When this spring fatigues and doesn't fit into E segment, Mr. Vait says it can cause that film will be moved too much - that is, as he says, to make large spaces. So, it should be enough to properly pretension of spring.

Also, there Mr Vait describes checking if the H safety is working properly. Because I don't know how long his text will be available, and also because it is in Czech, I took the liberty of inserting its relevant part here (I hope I didn't allow too much, however):

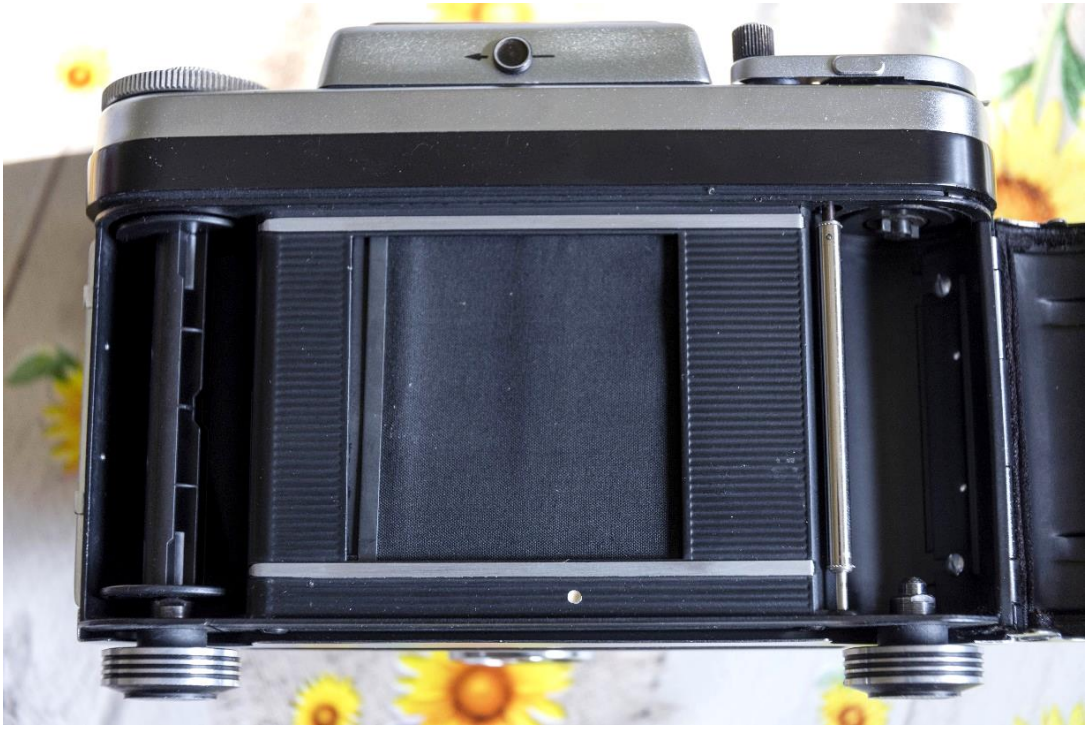
„If camera has a habit of overlapping frames, you can tell too, but it takes some practice: inside there is a so-called friction roller that measures length of film transport, which is supposed to behave as follows: if you rotate it (to right) as if there was a film inside, after a while it will stop and you will have to overcome much more resistance when you rotating. Hold roller with your finger and pull trigger (properly squeeze to the bottom). This should release roller and you should be able to easily rotate it further until next snap. If roller doesn't release when you press trigger and is still going stiff all the time, it's wrong and your Six is overlapping frames. It's all caused by one little spring that fatigues or even breaks off over time.“

Again, I have an addition to this: according to his text, it seems to me (but I'm not asleep) that he recommends rotating metering roller when trigger is pulled. I think this is just a misunderstanding, but since it seems to me that someone else might understand it that way I will add: trigger must be pressed thoroughly to full stop and released, then only rotate by metering roller, and when it goes easily safety has worked. If after releasing trigger safety hasn't worked (or is not there - serial number less than 15 500, see above), latch D fits back into notch of wheel C (as seen in picture A) and rotating metering roller will be difficult. So, this is clearly a malfunction only on cameras with serial numbers greater than 15 500, for those with smaller serial numbers it would require a look inside to see if someone added safety H.

To picture B, state after exposure, film and shutter stretching were not moved:

By pressing shutter release button, latch D is pulled out of notch in wheel C and safety H works and blocks possibility of reinserting latch D into notch, as seen in this picture (however, safety H was only in place from 15 500 onwards - see detour above), so that wheel C can rotate and measure film feed for next picture. Toothed wheel F is pulled out of take in teeth of segment E and mechanism is ready for next film rewind / shutter cocking.

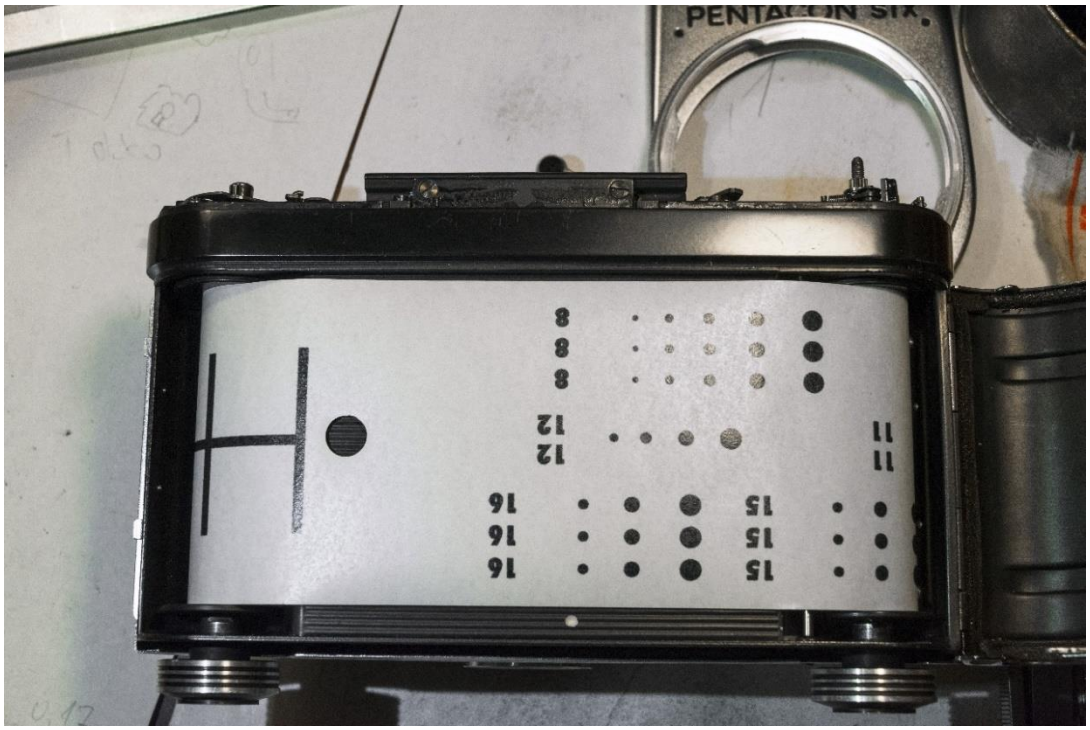
Braking segment of first curtain B is here already snapped into braking spring A. This is how it should look like when camera is working. With my piece, when I got it – it was bought as non-functional – it very often (almost always) happened that braking segment did not snap that far into corresponding spring, thus for first curtain it engage a little, for second one did not latch at all, it stayed standing in front of it. Result was that after exposure (if both curtains were run at all) view of shutter looked like this:



and there was often a small gap between visible metal edges of curtains. It helped to clean (wash) mechanism from old solidified lubricants and to lubricate it carefully (mostly with recommended mixture of fine oil with technical benzine in ratio 1 : 20).

One more addition to film transport step check:

Following image shows position of film (in this case empty paper) after exposing 13 images on my Pentacon six, film was established with arrows against dot on camera body. It also corresponds, of course, to "edible" position after exposing 12 images with normal spacing.



Following is valid for Pentacon six / TL, though probably also for Praktisix, but MUST be inserted with a complete film into it due to thickness (it will be destroyed), **not** just empty paper.

According to my measurements and calculations, it is better to set arrow about 1 cm in front of dot on camera body when inserting up film, there is a large enough margin. Then minimum position of centre of last frame on paper, considering an average space between frames of 2 mm after exposing 12 frames, is about 15 mm in front of centre of image 11, or after exposing 13 frames is about 19 mm in front of centre of image 12. On the other side, most posterior position of centre of last image is about 18 mm behind centre of image 12, this is of course without lighting through hole marking end of film, if by chance camera had a window to view film numbers, it normally didn't, but I have seen Pentacons edited this way on internet too.

So, if after 12 or 13 exposures paper ends up at a smaller number than I wrote, it is quite certainly overlapping images, or if paper shifted further will be big gaps.

However, this method is only tentative, it can't detect possible unevenness in film transport, theoretically (if practically I don't know) it could happen that some frames would overlap and there would be a bigger gap elsewhere. So, the best method is method described above of drawing edges of image window on cover paper/film.

Supplement to eyecups usable on Praktisix / Pentacon six:

Because (as I've mentioned here) I can't see well without glasses, I've been looking for a long time for some kind of eye shell for prism viewfinder on Praktisix and co. that I could put a corrective lens in so I wouldn't have to keep changing glasses when I shoot. There are eye shells on internet (eBay etc), but I didn't want to pay these prices (with shipping, 1000,- CZK [that's approx. 40 €] and that is usually not enough). In the end I bought an eyecup according to seller intended for Praktina, with a thread of 18 mm

outer diameter as seller also stated. So not with bayonet that is used by Praktisix and co. Such a thread is also in ocular housing of prismatic viewfinders for Praktisix and derived types. After testing, I found out that of my two viewfinders, this eye shell can be screwed on only on viewfinder without TTL metering (it has an ocular like new), but it doesn't suit on viewfinder with TTL metering, because it doesn't hold and falls out – the ocular is more "worn". However, original Flash shoe holds well on both viewfinders. After remeasuring with calliper, my eye shell has an outer thread diameter of about 17,77 mm and Flash shoe has an outer thread diameter of 17,94 mm. Viewfinder without measurement has an inner thread diameter of about 17,55 mm and viewfinder with TTL measurement about 17,67 mm, and I measured a little more in some places. So, buying such an eye shell without testing it is probably quite risky, especially if threads in eyepiece of finder or on eye shell are already "worn", however when threads are in order eye shell holds and can be used.

Then I decided to buy eye shell for Praktica L in a second–hand shop, because it had a built–in corrective lens, which is also hard to find, and price of this eye shell was not great, so I thought I would redo lens into eye shell with thread, diameter should match. Once I had eye shell for Praktica at home, I thought I'd try it on a Praktisix viewfinder with metering, as I was repairing it and when I reassembled it, I didn't slide eyepiece tight to cover, so its socket has a gap of about 1 mm from the cover. And then I stared, because rectangular clamping frame which eye shell for Praktica L has, fits exactly on circular eyepiece socket of Praktisix viewfinder and also holds there. But because Praktisix viewfinder ocular is round, it is possible that the clamping frame of Praktica eye shell will not always line up exactly - it can be put on however you like, but it doesn't matter (except in appearance). Well, did the Germans have it all worked out back then, or is it a coincidence? The viewfinder on the Praktisix without measuring had eye shell collar tight against the housing, there could not be Praktica eye shell fitted without adjusting ocular mounting. Since I have already tested that moving ocular by about 1 mm does not affect imaging in it, and can be done without disassembling viewfinder, I did so and it is very "edible", so I can recommend this. To move ocular, loosen two grooved cylindrical headless screws under ocular that lock it in place - beware, they are secured with paint - ocular will elevate, screws will tighten and secure with paint. I've also tried eye shell from Exakta VX1000 and VX500 which I also have, and it fits exactly the same. Outer diameter of ocular rim of Praktisix viewfinder is about 25,8 mm, this is probably what these eye shells are made for.

For illustration I attach some photos to make it clear what is involved.

Eye shell for Praktina with thread

and screwed onto viewfinder without measuring

Eye shell for Praktica L

and mounted onto viewfinder without measuring

Ejected ocular of viewfinder.

Original eye shell label for Praktica L.

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Luděk Ruffer 26 January 2023 (English translation 18 February 2023)