Examiners' Report - Paper A 2006 (Electricity/Mechanics)

General considerations - Analysis of the client's letter

The client produces and sells sewing machines in various countries. He also owns service centres, where sewing machines are repaired and upgraded.

The client's letter mentions two different problems relating to sewing machines, solved by two different arrangements. The problem first mentioned in the letter (PROBLEM 1) relates to a sewing machine being driven alternatively by an electric motor and by a treadle without any need for the user to modify the configuration of the sewing machine, such as disconnecting a belt and connecting another belt. The second problem (PROBLEM 2) is mentioned at the very end of the letter and deals with the shaft of a treadle driven sewing machine potentially starting to rotate in the incorrect direction (i.e. opposite to the working direction) depending on the position that the machine last came to rest.

The main task of the paper was therefore to analyse the solutions to each of these problems, and to evaluate the possibility of drafting claims defining solutions to both problems in a single unitary application. This is consistent with the requirement in the instructions to candidates to provide the broadest possible protection to the client.

Basically, both problems are solved by the common inventive concept of installing at least one one-way clutch on a sewing machine shaft. More specifically, PROBLEM 1 is solved by the use of two one-way clutches appropriately mounted on the shaft of a sewing machine (hereafter “two-clutch arrangement” or “two-clutch solution”). PROBLEM 2 is solved by a single one-way clutch in a “one-clutch arrangement” (so-called “one-clutch solution”).

It should also be noted that the combination of a shaft, a single one-way clutch and a pulley is known (cf. “commercially available” on page 5, 2nd paragraph, 3rd sentence of the client's letter), so that an apparatus claim should be directed to a sewing machine rather than to a drive assembly.

Candidates who saw that a sewing machine comprising a single one-way clutch was the broadest defensible solution had a good chance of passing. Candidates who went for solutions directed to a two-clutch arrangement (inferior solutions) lost points, but they still had a fair chance of passing the paper. They could compensate some of the points lost by making a proposal for a separate application directed to the preferred one-clutch solution.

1. Independent claim(s) (50 points)

As a result of the analysis above, the main claim should have been directed to a sewing machine with means for solving PROBLEM 2.

Due to the activity of the client in his worldwide service centres, a claim directed to a method of upgrading an old type sewing machine is important to provide full protection. Other method claims such as a claim directed to a method of operating such a sewing machine or to the use of such a machine are considered superfluous in terms of the protection they confer.

The independent apparatus claim was marked out of 80% of the points available for the independent claims. A method claim directed to the upgrade of an existing sewing machine was marked out of 20% of the points available for the independent claims.

Preferred solution

A good solution for the apparatus claim provides protection for both a new sewing machine and an old type sewing machine which has been upgraded.
A suitable claim should include the following elements:

a sewing machine,
a shaft,
a pulley,
a driving relationship between the shaft and pulley,
a one-way clutch forming part of the driving relationship.

A claim corresponding to that preferred solution was marked out of a maximum of 40 points.

One example of a suitable claim is:

(a) A sewing machine comprising
(b) a shaft and a pulley mounted on the shaft,
(b1) the shaft being drivable via the pulley to rotate,
characterised by
(c) a one-way clutch mounted between the shaft and the pulley.

This is only one example amongst several equally good possible formulations.

A claim directed to a driving assembly for a sewing machine ran the risk of lacking novelty or clarity, as further explained below.

Although slightly more restricted than the preferred solution, a claim directed to "a treadle driven sewing machine" or the inclusion of a treadle in the claim was not penalised. The reason for this was that PROBLEM 2 was presented in the client's letter as being associated with treadle-driven machines (page 7, para. 3).

A pulley may be generalised to some "driving means" in order to cover equivalent features, such as a gear wheel (for co-operation with a chain, like in a bicycle!). This was however not expected, as there is no hint for such a broadening in the client's letter, at least in relation to a sewing machine.

A functional link between the shaft and the pulley, such as feature (b1) above, was expected in order to fully comply with the requirement of clarity.

In feature (c) above, the terms "clutch", "pulley-clutch assembly" and "one-way clutch" are all acceptable, provided that the concept of "one-way" is present in the claim in one way or another. This can obviously be achieved by the use of the term "one-way", but also, alternatively and as examples, by the use of at least one of the features:

(c1) such that, when the pulley starts rotating in a first/working direction, the clutch engages (and the shaft rotates),

or

(c2) such that, when the pulley starts rotating in a second direction opposite to the first/working direction, the clutch disengages.

In cases where the concept of "one-way" was not present in the claim, a deduction for lack of clarity applied. No penalty was applied if the concept was defined more than once in the claim (e.g. by the combined use of features (c), (c1) and (c2)). Furthermore it was considered possible but not necessary to define the orientation of the one-way clutch, i.e. the direction of rotation of the shaft in which the one-way clutch disengages and/or the direction in which it engages.

The generalisation of a one-way clutch (e.g. "means for preventing the shaft from rotating") could possibly result in independent apparatus claims not covering the client's embodiments with a one-way clutch (e.g. "means for blocking the shaft"). Such claims attracted very few points, as they excluded the client's main embodiments.

As already mentioned, a method claim to the upgrading of an old type sewing machine was also expected. It could for example read:

(a) A method of upgrading a sewing machine
(b) comprising a shaft,
(c) the method comprising the step of mounting a pulley and one-way clutch assembly on the shaft, so that the shaft is drivable by the assembly to rotate.

Such a claim was marked out of a maximum of 10 points.

Alternative formulations were acceptable, provided they covered the process of upgrading.

The use of wording such as “inserting a one-way clutch between the shaft and a pulley mounted on the shaft” or “replacing a pulley mounted on the shaft with a pulley and one-way clutch assembly” was not penalised, although such formulations lead to a more limited scope of protection.

Comments relating to the apparatus claim above also apply by analogy to the method claim.

Inferior solutions

As already mentioned, an independent claim to a two-clutch arrangement was considered to represent an inferior solution, as it led to a part of the client’s invention being excluded from protection.

Such an independent claim to a two-clutch arrangement attracted at most 32 points, i.e. 80% of the points available for an independent claim to a one-clutch arrangement.

An apparatus claim directed to the solution of PROBLEM 1 could for example read:

(a) A drive assembly for a sewing machine comprising
(b) a shaft and first and second pulleys mounted on the shaft,
(b1) the shaft being drivable in rotation via each of the pulleys, characterised by
(c) first and second one-way clutches respectively mounted between the shaft and the first and second pulleys,
(d) such that both one-way clutches freewheel in the same direction of rotation of the shaft.

A reference to a sewing machine is not necessary to provide novelty and inventive step to a correctly formulated apparatus claim directed to the two-clutch solution. However, a claim comprising the same features as above but directed to a sewing machine was also regarded as a good solution.

A claim directed to “a treadle and electric motor driven sewing machine” or the inclusion of a treadle and/or an electric motor in the claim provides limitations that were not penalised. The reason for this was that PROBLEM 1 was presented in the client's letter as being associated with treadle-driven and electric motor driven machines (page 4 para. 1).

Feature (d) could equally be replaced by e.g.

(d1) such that, when the first pulley starts rotating, the second clutch disengages and the second pulley remains stationary, and
(d2) such that, when the second pulley starts rotating, the first clutch disengages and the first pulley remains stationary.

Likewise, a method claim directed to an upgrade of a sewing machine with two clutches so as to solve PROBLEM 1 attracted at most 8 points, i.e. 80% of the points available for the method claim of the preferred one-clutch solution.

The claim should in principle provide protection for an upgrade starting from a sewing machine equipped with one pulley as well as with two pulleys.

It could for example read:

(a) A method of upgrading a sewing machine
(b) comprising a shaft,
(c) the method comprising the step of mounting first and second one-way clutch and pulley assemblies on the shaft,
(d) such that both one-way clutches freewheel in the same direction of rotation of the shaft.

Alternative formulations were acceptable, provided they covered the process of upgrading.

The use of wording such as “inserting a one-way clutch between the shaft and a pulley mounted on the shaft” or “replacing a pulley mounted on the shaft with a pulley and one-way clutch assembly” was not penalised, although such formulations lead to a more limited scope of protection.

Comments relating to the apparatus claim above also apply by analogy to the method claim.

Novelty

Lack of novelty was a serious deficiency and resulted in the loss of 24 points for an apparatus claim and 6 points for a method claim.

The combination of a pulley, one-way clutch, adaptor bushing and shaft is known per se (see page 5, para. 2). A claim directed to a drive assembly limited to these elements therefore lacks novelty. However, an appropriate relationship to a sewing machine could establish novelty for a claim directed to such a combination of features. Normally, this relationship was established by suitably defining the shaft (e.g. sewing machine shaft).

Over-generalization of features relating to the one-way clutch(es) ran the risk of being anticipated by the prior art sewing machines, as described by the client in relation to Figures 1, 2, 3A and 3B.

Inventive step

A claim directed to a sewing machine with a one-way clutch according to the preferred solution is considered to involve an inventive step because there is no motivation in the prior art to use a one-way clutch together with a sewing machine or to use a one-way clutch to solve PROBLEM 2
(preventing accidental rotation in the wrong direction).

Cases lacking inventive step were uncommon this year.

Unnecessary limitations

This year, up to 25 points available for the independent claim(s) (up to 20 points for an apparatus claim, up to 5 points for a method claim) were lost in the case of unnecessary limitations, some of which were:

- belt, handwheel, flywheel or link rod, which are presented in the client's letter as known features of a conventional sewing machine led to a minor deduction (-4 points for an apparatus claim, -1 point for a method claim) for each such unnecessary feature.

- for the one-clutch solution only: an apparatus claim directed to an electric motor driven sewing machine or comprising an electric motor, and a method claim involving an electric motor was more heavily penalised (-10 points for an apparatus claim, -2 points for a method claim).

- a specific technique for mounting a clutch onto a shaft (e.g. “splined engagement” or "adaptor bushings") led to a high deduction (-12 points for an apparatus claim, -3 points for a method claim).

Clarity

For both the independent apparatus claim and the independent method claim, lack of clarity was penalised this year, according to its seriousness, with deductions of up to 25 points (up to 20 points for an apparatus claim, up to 5 points for a method claim).

The following illustrates some of the main sources of lack of clarity.

Up to 6 points were deducted for unclear references to features which were not part of the claimed subject-matter (see the Guidelines for examination, C-III, 4.8a), e.g. "drive assembly for a sewing machine with a shaft, the drive

assembly comprising a pulley mounted on the shaft". However, a claim to a "drive assembly for a sewing machine with a shaft, the drive assembly comprising a pulley mountable on the shaft" would be clear.

A one-clutch arrangement in which the only link to a sewing machine is provided by the shaft (e.g. "a shaft for a sewing machine", "a shaft suitable for a sewing machine", "a shaft adapted for a sewing machine" or a "sewing machine shaft") was generally regarded as lacking clarity (up to -8 points for an apparatus claim, up to -2 points for a method claim), because the limiting features of such a shaft are not at all clear; it remains completely open in which way the shaft relates to the sewing machine.

Claims in which the concept of "one-way" was clearly not present were subject to a deduction of up to -12 points for an apparatus claim and up to -3 points for a method claim.

Claims in which the relation between shaft, pulley(s) and one-way clutch(es) was particularly unclear led to a heavier deduction (up to -15 points for an apparatus claim, up to -3 points for a method claim). A similar deduction was applied to claims directed to a two-clutch arrangement, wherein the cooperative function of both one-way clutches was not explicitly defined, for example by feature (d). An equal deduction was made when a feature in a formally dependent claim resulted in the claim having a broader scope than the independent claim from which it depended. Such a formulation led to doubts as to the broadest scope conferred by the set of claims. An example is: "sewing machine according to claim 1 in which the two one-way clutch and pulley assemblies are replaced by a single one-way clutch and pulley assembly".

A severe deduction was applied in cases where the relation between the claimed features was completely missing (up to -16 points for an apparatus claim, up to -4 points for a method claim).

Extreme examples of this are “a sewing machine comprising a one-way clutch.” or “a sewing machine comprising two one-way clutches”, without any further definition of the relationship between the claimed features.

Formal matters

A clearly incorrect two-part form resulted in a minor deduction (up to -3 points).

Correct reference signs were also expected. Otherwise, up to -2 points were deducted. However, in the specific case of the one-clutch solution only, the absence of reference signs in the independent apparatus claim was not penalised, as the claimed subject-matter is not shown on any of the drawings available from the client.

Separate application

This year, a bonus of 5 points was awarded to candidates who saw the possibility of claiming a one-way arrangement in a separate application, even though they had decided to direct their independent claim(s) to the two-clutch solution. Full bonus points were only awarded when the subject of such a separate application was clearly defined. This could be done by drafting a corresponding claim or by unambiguous reference to features of the chosen independent claim(s).

Additional 5 bonus points were also available for proposing a separate application directed to the elongated extension shaft of Fig. 5C. Again, full bonus points were awarded only to solutions that clearly defined the subject of the separate application, in particular the fact that a clutch is not part of the claim of the separate application or that the elongated extension shaft can be used on prior art sewing machines with two pulleys.

2. **Dependent claims (40 points)**

For solutions with an independent claim along the lines of the preferred one-clutch solution, the two-clutch solution was considered the most valuable fall-back position for the client. Dependent (apparatus and method) claims directed to this aspect received up to 15 points.

Such a dependent apparatus claim could read:

(a) Sewing machine according to claim 1
(b) comprising a further pulley and a further one-way clutch,
(c) the further one-way clutch being mounted between the shaft and the further pulley
(d) such that both one-way clutches freewheel in the same direction of rotation of the shaft.

An example of a corresponding dependent method claim is:

(a) Method according to claim ...
(b) further comprising the step of mounting a further pulley and one-way clutch assembly on the shaft
(d) such that both one-way clutches freewheel in the same direction of rotation of the shaft.

Comments relating to the independent claims of the inferior solution apply by analogy to these claims.

The remaining 25 points for the dependent claims were available for papers having as independent claim(s) either the preferred or the inferior solution. A set of well-structured, clear dependent claims was expected. These should have covered the three main embodiments of Figures 5A to 5C of the client's letter.

A good set of dependent claims could have the following structure (starting from claim 3 below):

[claim 1: one-clutch arrangement - see above]
[claim 2: two-clutch arrangement - see above - (dependent on claim 1)]
claim 3: a bushing for fixing the clutch and pulley assembly (dep. on claim 1)
claim 4: bushing arrangement for fixing the clutch and pulley assemblies (dep. on cl. 2)
claim 5: a separate bushing for each clutch and pulley assembly (dep. on claim 4)
claim 6: a single bushing for both clutch and pulley assemblies (dep. on claim 4)
claim 7: extension shaft (dep. on claims 2, 4-6)
claim 8: bushing serving as the extension shaft (dep. on claim 7)

Few points were available for dependent claims directed to minor details of the mounting of the pulley-clutch assemblies e.g. splined connection. Other features known from conventional sewing machines and not related to the core concept of the invention, such as belts, handwheel, flywheel or link rod, were in principle not rewarded.

Dependent method claims including a step or steps defining how a specific element is mounted on the sewing machine shaft also attracted a few points (e.g. heat shrinking).

Candidates who drafted an independent apparatus claim directed to a driving assembly (for a sewing machine), received the maximum number of points for the dependent claims only by including a claim to a sewing machine comprising such a driving assembly.

3. **Description (10 points)**

Only the prior art relevant to the chosen independent claim(s) was expected to be mentioned.

For the preferred one-clutch solution, treadle-driven sewing machines with a single pulley represented the closest prior art. For the inferior two-clutch solution the closest prior art is shown in Fig. 3B of the client's letter.

Points were available for a presentation of the correct problem and its solution starting from the closest prior art and relating to the independent claim(s). Most importantly, the claimed combination of features must provide a solution to the defined problem. Solutions that mentioned two (or more) problems without making it clear which one is solved by the combination of features of the drafted independent claim(s) attracted very few points.

For the preferred one-clutch solution, the problem solved over the prior art resides in avoiding the rotation of the sewing machine shaft in an undesired direction, i.e. opposite to the working direction of rotation (cf. PROBLEM 2).
For the inferior two-clutch solution, PROBLEM 1 (as defined above) must be referred to.

EXAMINATION COMMITTEE I Candidate No. .....

Paper A (Electricity/Mechanics) 2006 - Schedule of marks

Category	Maximum possible	Marks awarded	
		Marker	Marker
Independent claims	50		
Dependent claims	40		
Description	10		
Total	100		

Sub-Committee for Electricity/Mechanics agrees on ..... marks and recommends the following grade to the Examination Board:

☐ PASS
(50-100)

☐ FAIL
(0-49)
COMPENSABLE FAIL
(45-49, in case the candidate sits the examination for the first time)

14 July 2006

Chairman of Examination Committee I