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Datasheet for the decision of 14 November 2025

Case Number: T 0616/23 - 3.5.06

Application Number: 20186978.1

Publication Number: 3754456

IPC: G06F1/16, H04M1/02

Language of the proceedings: EN

Title of invention:
FOLDABLE DISPLAY DEVICE

Applicant:
Samsung Electronics Co., Ltd.

Headword:
Foldable display/SAMSUNG

Relevant legal provisions:
EPC Art. 84, 56
EPC R. 42

Keyword:
Claims - no missing essential features

Decisions cited:
T 0032/82, G 0001/04

Catchword:

Europäisches Patentamt
European Patent Office
Office européen des brevets

Beschwerdekammern

Boards of Appeal

Chambres de recours

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Case Number: T 0616/23 - 3.5.06

D E C I S I O N
of Technical Board of Appeal 3.5.06
of 14 November 2025

Appellant: (Applicant)	Samsung Electronics Co., Ltd. 129, Samsung-ro Yeongtong-gu Suwon-si Gyeonggi-do 16677 (KR)
Representative:	Nederlandsch Octrooibureau P.O. Box 29720 2502 LS The Hague (NL)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 14 December 2022 refusing European patent application No. 20186978.1 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman	M. Müller
Members:	G. Zucka
	B. Müller

Summary of Facts and Submissions

I. The appeal is against the decision by the examining division, dispatched with reasons on 14 December 2022, to refuse European patent application 20186978.1, on the basis that neither the main request nor either of the auxiliary requests then on file satisfied the requirements of Article 84 EPC and auxiliary request 2 then on file did not satisfy the requirements of Article 123(2) EPC.

II. The following document cited by the examining division is referred to in the present decision:

D1: WO 2016/140524 A1.

During the oral proceedings before the board, the appellant submitted a link to a compressed file containing four video files illustrating the subject-matter of claim 1. The files were retrieved and watched by the board. For illustration, some image captures from the videos are included below.

III. A notice of appeal was received on 14 February 2023, the appeal fee being paid on the same day. A statement of grounds of appeal was received on 17 March 2023.

IV. The appellant requested that the decision under appeal be set aside and a patent granted on the basis of the claims of the main request underlying the decision under appeal, re-filed with the statement of grounds of appeal.

V. The board issued a summons to oral proceedings together with a communication under Article 15(1) RPBA, in which

it set out its preliminary opinion, according to which the claims did not satisfy the requirements of Article 56 EPC.

VI. On 24 September 2025, the appellant responded to the summons with a letter dated 23 September 2025. It maintained its existing request as main request and filed claims for two auxiliary requests.

VII. The appellant requests that the decision under appeal be set aside and a patent be granted on the basis of claims 1 to 14 of the (then sole, now main) request filed with the statement of grounds of appeal or of auxiliary request 1 or 2 filed with letter dated 23 September 2025.

The further text on file is:

description pages
1 to 76 as originally filed;

drawing sheets
1 to 41 as originally filed.

VIII. Claim 1 of the main request reads as follows:

A portable electronic communication device comprising:
a flexible display (50) including a first portion (51), a second portion (53) and a central portion (52) between the first and the second portions;
a first housing (110) disposed to support at least a part of the first portion of the flexible display;
a second housing (120) disposed to support at least a part of the second portion of the flexible display;

wherein the flexible display (50) is not supported by the first and the second housings (110, 120) in said central portion (52); and

a hinge structure (300) coupled to the first housing and the second housing and disposed under the display,

characterized in that the hinge structure comprises:

a first bracket housing (310) configured to couple to the first housing (110);

a second bracket housing (380) configured to couple to the second housing (120);

a first main gear (341) configured to rotate about a first axis, and

a second main gear (342) configured to rotate about a second axis that is parallel to the first axis,

a first idle gear (351) and a second idle gear (352) disposed between the first main gear and the second main gear and configured to rotate during rotation of the first main gear relative to the second main gear,

a first inner bracket member (320) configured to couple to the first bracket housing (310), and to rotate about a third axis (911) that is parallel to the first axis while the first main gear rotates about the first axis,

a second inner bracket member (370) configured to couple to the second bracket housing (380) and to rotate about a fourth axis (912) that is parallel to the second axis while the second main gear rotates about the second axis,

wherein the third axis (911) and the fourth axis (912) are located in correspondence with the central portion of the display (52) so as to be parallel to and offset from each other in a plane spaced apart from a surface of the flexible display by a specific height, in a state in that the first area (51) and the second

area (53) of the flexible display are unfolded to be in a same plane.

IX. Compared to the main request, claim 1 of auxiliary request 1 additionally specifies that the third axis is non-coincident with the first axis or the second axis, and the fourth axis is non-coincident with the first or the second axis.

X. Compared to the main request, claim 1 of auxiliary request 2 additionally specifies that the third axis is spatially offset from and non-coincident with the first axis, and the fourth axis is spatially offset from and non-coincident with the second axis, wherein a shortest distance from the third axis (911) to the surface of the flexible display is shorter than a shortest distance from the first axis to the surface of the flexible display, and wherein a distance between the third axis (911) and the fourth axis (912) is shorter than a distance between the first axis and the second axis.

XI. At the end of the oral proceedings, the chairman announced the board's decision.

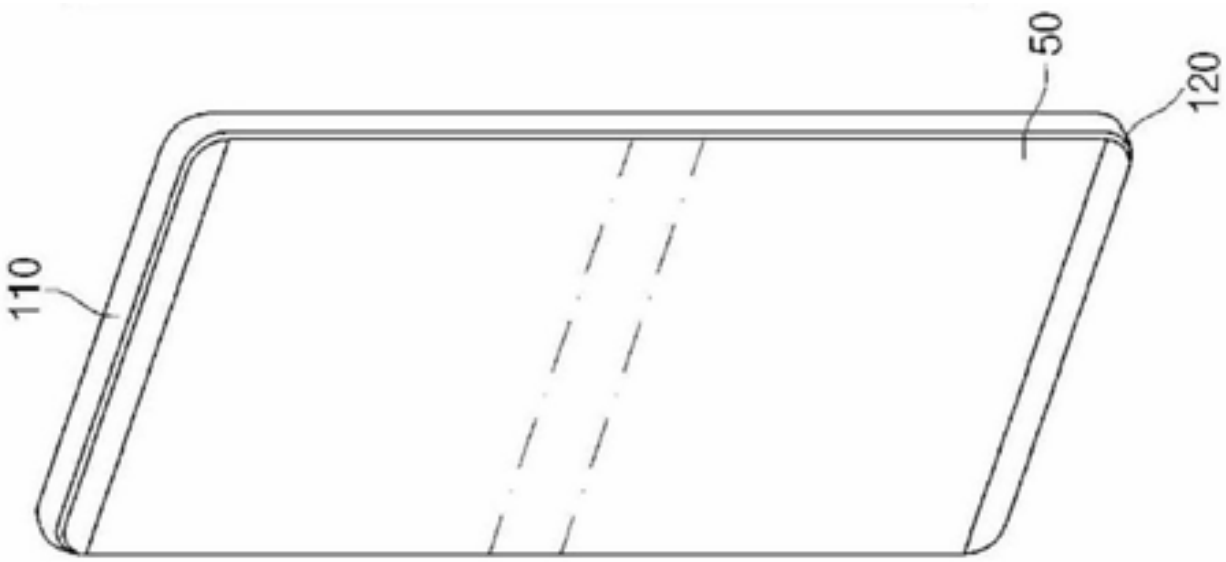
Reasons for the Decision

1. *The application*

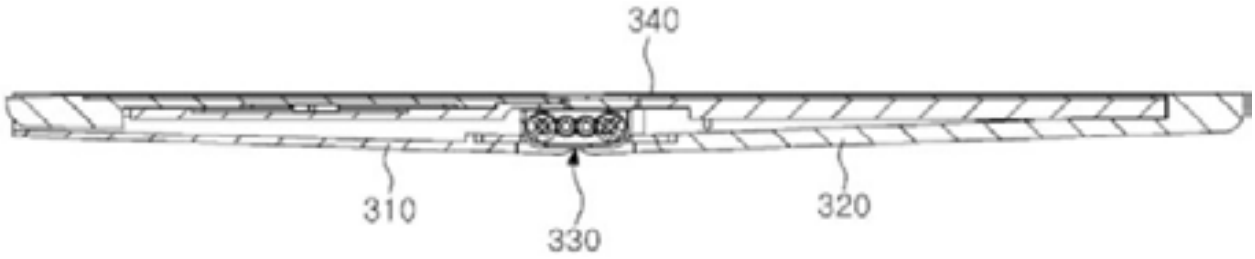
1.1 The application relates to foldable portable electronic devices with a display, such as a smartphone. Foldability allows increasing the screen size whilst maintaining portability. (See description [0003]).

1.2 According to the description (par. [0008] and [0009]), the use of hinges and joints in such a device according to the prior art causes some problems, which the application intends to solve.

1.3 The approach followed in the application consists in a particular hinge structure applied to a prior art arrangement comprising a flexible display (50) supported by a first (110) and a second (120) housing, which prior art arrangement is illustrated in figure 2 of the application:

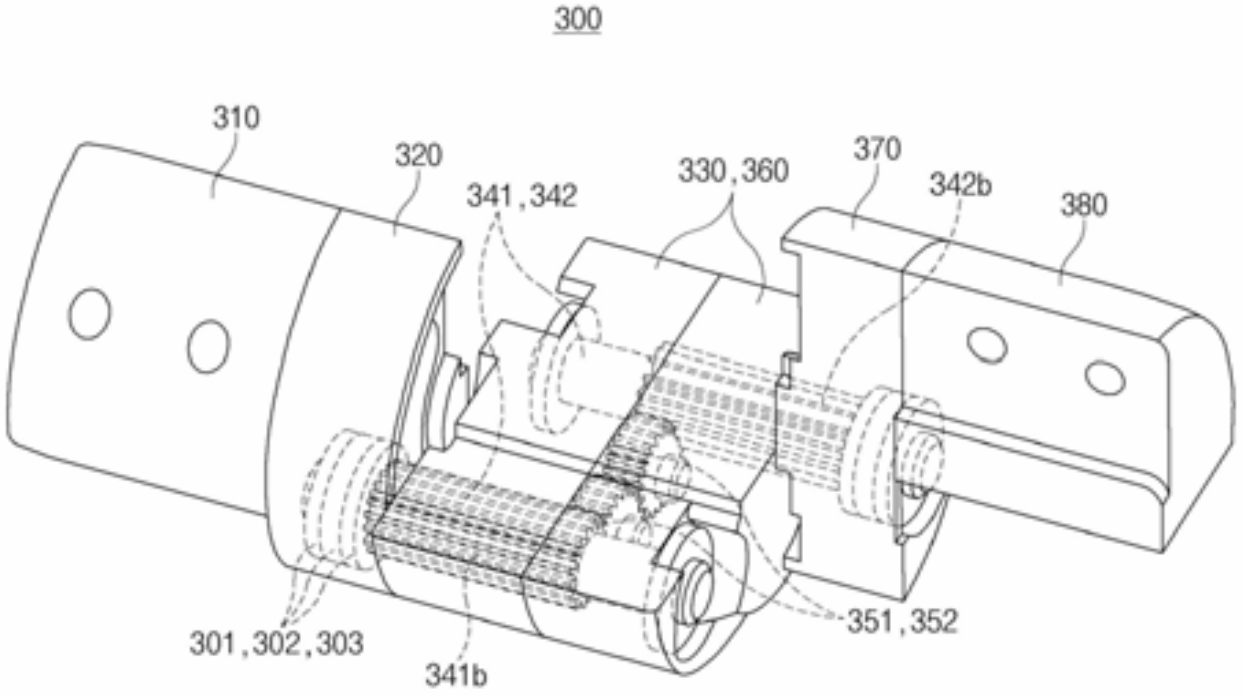


1.4 As is also known from the prior art, see structure 330 in the following figure 9 in D1 (with flexible display 340), the hinge structure (300) of claim 1 comprises a first (341) and a second (342) main gear rotating about respectively first and second axes which are parallel to each other, and first (351) and second (352) idle gears disposed between the first and the second main gear and configured to rotate during rotation of the first main gear relative to the second main gear:



1.5 As pointed out by the appellant during the oral proceedings before the board, the rotating idle gears imply the existence of two additional axes, next to the four axes explicitly referred to in claim 1.

1.6 The hinge structure (300) of claim 1 further comprises, as illustrated e.g. in the following figure 7 of the application, first and second bracket housings configured to couple to respectively the first and the second housing (310, 380), with first and second inner bracket members (320, 370) configured to couple to respectively the first and the second bracket housing and to rotate about respectively third and fourth (virtual, i.e. non-physical) axes which are parallel to respectively the first and the second axis while respectively the first and the second main gear rotate about respectively the first and the second axis:

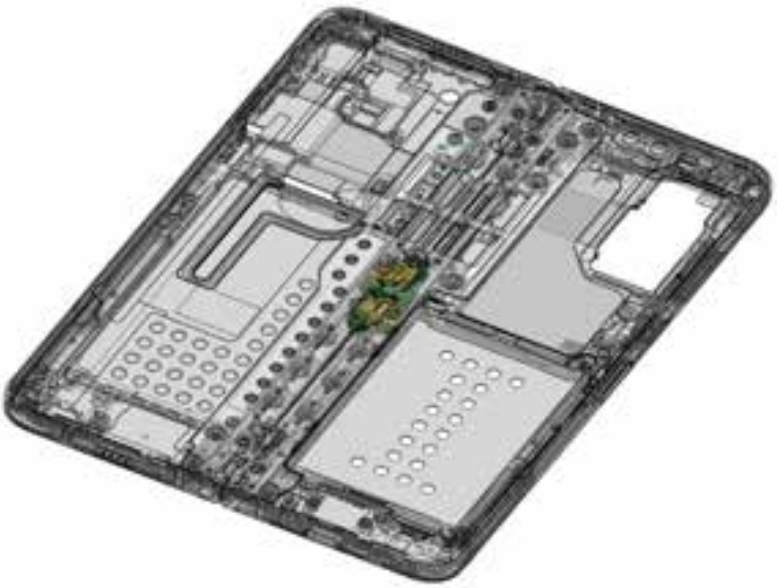


1.7 The third and the fourth (virtual) axes are located in correspondence with the central portion of the display so as to be parallel to and offset from each other in a plane spaced apart from a surface of the flexible display by a specific height, in a state in that the first and the second area of the flexible display are unfolded to be in a same plane.

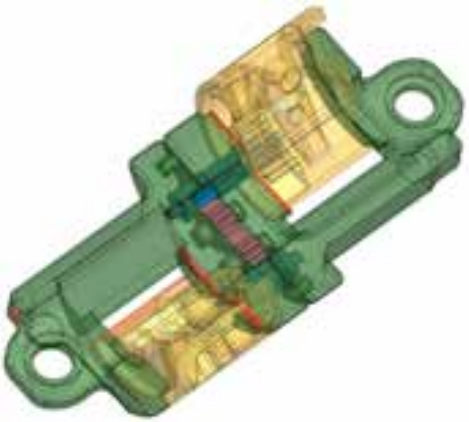
In such manner, the first (320) and second (370) inner bracket members are forced from the unfolded position to a folded position by travelling from one end of the curved opening within the inner bracket members to the other while the first (341) and second (342) main gear rotate around the fixed first and second axis, and thus ensure that a gap is created allowing the central portion of the flexible display to fold in a U-shape reducing the stress induced to this display portion by the folding, as described in par. [00113] to [00120] and figures 9A to 9C of the application.

This is further illustrated in the following images extracted from the video files provided by the appellant during the oral proceedings:

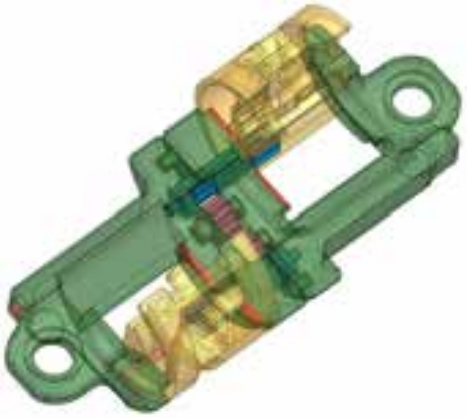
Opened device

Hinge structure	**Device**
	

Half-opened device

Hinge structure	**Device**
	

Closed device

Hinge structure	**Device**
	

2. *Essential features; Article 84 EPC*

2.1 According to the appealed decision (point 13.2), claim 1 is missing essential technical features, viz. a first curved opening having a first saw-toothed inner spur gear that is engaged with a first gear pattern part of the first main gear in the first inner bracket member, and a second curved opening having a second saw-toothed inner spur gear that is engaged with a second gear pattern of the second main gear in the second inner bracket member.

The appealed decision (point 13.2.1, third paragraph) considers these features to be essential because the rotation of the first and second bracket members around respectively the third and fourth axes is "primarily due to" their presence, and because they are indispensable to force the inner bracket members from the unfolded to a folded position.

2.2 The board notes that the requirement that an independent claim should contain all the essential features required to solve a technical problem does not follow directly from the EPC. Instead, it follows from the established practice at the EPO to require this under Article 84 EPC.

For instance, G 1/04, Reasons 6.2 states that "an independent claim within the meaning of Rule 29 EPC [1973] should explicitly specify all of the essential features needed to define the invention", and Reasons 6.2.4 refers to "the well-established jurisprudence of the EPO in respect of Article 84 EPC, which requires that [...] an independent claim must recite all the essential features for clearly and completely defining a particular invention".

It has also been stated: "As essential features have to be regarded all features which are necessary to obtain the desired effect or, differently expressed, which are necessary to solve the technical problem with which the application is concerned" (see T 32/82, Reasons 15, cited by many other decisions). This case law is also reflected in the Guidelines for Examination F-IV, 4.5.2 as cited the by the appellant.

2.3 The examining division has not detailed in what way the saw-toothed inner spur gears are "indispensable" or why the argument that they are the primary cause of or indispensable for the rotation show a lack of essential features within the meaning of Article 84 EPC. Nor did the examining division cite the Guidelines for Examination or how they applied to the present case.

2.4 The description does not qualify the saw-toothed inner spur gears as essential. In paragraph 86, a hinge

structure comprising them is explicitly disclosed as merely an *illustration*, and the disclosure in paragraphs 113 to 120 with respect to figures 9A to 9C also expressly describes *embodiments* of the invention, while not all features of an embodiment of the invention are *per se* essential.

The board can see no reason *a priori* either why the specific presence of saw-toothed inner spur gears in correspondence with the curved openings within the inner bracket members should be an objective requirement.

One can for instance not *a priori* exclude a toothless structure where the coupling is solely ensured by friction, nor can one for instance *a priori* exclude some polygonal structure instead of a curved opening within the inner bracket members.

2.5 The board therefore comes to the conclusion that the "saw toothed inner spur gears" are neither disclosed as essential nor objectively essential to achieve the desired rotation. The board is also not aware of other reasons for which they might be essential.

2.6 According to the statement of grounds of appeal (paragraph spanning pages 2 and 3), essential for the folding of the display are the features which define the rotation around the (first to fourth) axes located with respect to each other in claim 1 and have the effect that, when the flexible display is folded, it is folded into a U-shape, which creates a dent or crack in the centre of the display, and that the space between the first and the second bracket housings prevents the

display from fully collapsing, thereby preventing damage due to the folding of the display.

2.7 The board has made a prima facie assessment as to whether this effect is actually achieved by the claim language in view of the question whether other features than those mentioned in point 2.6 might have to be considered essential.

2.7.1 The first and second gears rotate about first and second axes. First and second idle gears are placed between the first and second axes. First and second inner bracket members are coupled to the housing and rotate around third and fourth axes which are parallel to the first and second axes, respectively. The board notes that it accepts the appellant's argument that the skilled person would interpret two parallel axes as being different (see also point 3.6 below). The third and fourth axes lie "in a plane spaced apart from a surface of the flexible display". As the appellant confirmed during oral proceedings, with these limitations the claim does not exclude the possibility that all six axes lie in that same plane. In particular, the claim language does not imply the relative arrangement of the axes as depicted in figure 9B.

2.7.2 Nonetheless, the board accepts that the six claimed axes may be used to achieve the described U-shape with the central dent and that this has an impact on stress in the central portion of the screen. A further reduction on stress on the screen due to a particular relative placement of the axes relative to each other is not achieved over the whole scope of the claim given that this particular placement is not claimed. However, the board also accepts that the use of six axes

provides a degree of freedom that might enable a suitable placement.

2.7.3 The board is consequently of the opinion that the appellant has made plausible that a relevant technical effect of the claimed hinge is achieved by the specifically claimed features and therefore comes to the conclusion that in order to achieve these effects no essential features are missing in claim 1 of the main request (Article 84 EPC).

3. *Main request - comparison with the prior art*

3.1 During examination of the appeal, the board considered which effects could be said to be achieved by the claimed subject-matter, because the findings in this respect might have an impact on inventive step. Specifically, if it remained unclear which technical effect was achieved by the features distinguishing the claimed invention from a relevant piece of prior art, doubts about inventive step over that prior art might arise (cf. the board's annex to the summons to oral proceedings, point 5.7).

3.2 In this context, the board considered D1 as a suitable starting point for an inventive step analysis of claim 1 of the main request.

3.3 D1 discloses a portable electronic communication device with a flexible display (reference number 340 in figures 5 to 7 and 9).

The flexible display includes a first portion (upper part of display 340 in figure 5), a second portion (lower part of display 340) and a central portion

(semi-circular part at the left of display 340) between the first and the second portions.

The device comprises a first housing (310) supporting at least a part of the first portion of the flexible display and a second housing (320) supporting at least a part of the second portion of the flexible display.

As is visible in figure 5, the flexible display is not supported by the first and the second housings in the central portion.

The device comprises a hinge structure (330) coupled to the first housing and the second housing and disposed under the display.

The hinge structure has a first axis (defined by rotary shaft 331 in figure 6) about which the first housing is rotatable and a second axis (defined by rotary shaft 332) about which the second housing is rotatable.

These preliminary and now final findings are substantially in line with what was stated in the European Search Opinion (point 3.1.1).

3.4 In addition, as is apparent from the left part of figure 5, D1 discloses a first and a second main gear rotating about respectively first and second axes which are parallel to each other, and first and second idle gears disposed between the first and the second main gear and configured to rotate during rotation of the first main gear relative to the second main gear.

3.5 D1 does not disclose first and second bracket housings configured to couple to respectively the first and the second housing (310, 380), with first and second inner

bracket members (320, 370) configured to couple to respectively the first and the second bracket housing and to rotate about respectively third and fourth axes which are parallel to respectively the first and the second axis while respectively the first and the second main gear rotate about respectively the first and the second axis, the third and the fourth axis being located in correspondence with the central portion of the display so as to be parallel to and offset from each other in a plane spaced apart from a surface of the flexible display by a specific height, in a state in that the first and the second area of the flexible display are unfolded to be in a same plane.

3.6 In its summons (point 5.5), the board had expressed its preliminary opinion that the wording of the claim does not exclude that the third and fourth axes are identical to respectively the first and second axes.

Indeed, following some mathematical definitions, an axis could be said to be parallel to itself. The claim's wording, according to which the third and fourth axes are parallel to respectively the first and second axes, would then allow for the third and fourth axes to be identical to respectively the first and second axes. However, the board acknowledges that in the present case the skilled reader is a person skilled in mechanics. Such a person, also because they would consult the description and the figures, where the axes are indeed different, would read the wording "parallel" as implying that the axes are different.

3.7 As a consequence, and as the appellant also stressed during the oral proceedings before the board, the device of claim 1 contains six axes.

The existence of six axes constitutes an additional difference between the subject-matter of claim 1 and the disclosure of D1. The board acknowledges that, as far as the functionality is concerned, the axes defined by the rotation of the idle gears in claim 1 correspond to the axes of the idle gears in figure 5 of D1. D1 does not disclose axes which correspond to the third and fourth axes of claim 1.

3.8 This additional difference and the arguments introduced by the appellant in its response to the summons, pages 2 to 4 constitute new elements which were not dealt with during the examination proceedings or in the European Search Opinion. Moreover, the board recalls that inventive step has not been decided upon by the examining division.

In exercising its discretion under Article 111(1), second sentence, EPC, the board considers these circumstances to constitute special reasons within the meaning of Article 11 RPBA for remitting the case to the examining division to consider the issue of inventive step (Article 56 EPC) in the light of the considerations above.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the examining division for further prosecution.

The Registrar: The Chairman:

L. Stridde Martin Müller

Decision electronically authenticated