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D E C I S I O N
of 3 November 2005

Case Number: T 1040/03 - 3.2.01
Application Number: 98121378.8
Publication Number: 0916426
IPC: B21D 22/14, B21D 41/04
Language of the proceedings: EN

Title of invention:

Method and apparatus for forming an end portion of a
cylindrical member

Patentee:

SANGO CO., LTD.

Opponent:

M&M Mechanika B.V.

Headword:

-

Relevant legal provisions:

EPC Art. 54, 56, 83

Keyword:

"Novelty (yes)"
"Inventive step (yes)"
"Disclosure - sufficiency (yes)"

Decisions cited:

T 0204/83, T 0970/00

Catchword:

-



Case Number: T 1040/03 - 3.2.01

D E C I S I O N
of the Technical Board of Appeal 3.2.01
of 3 November 2005

Appellant: SANGO CO., LTD.
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Respondent: M&M Mechanika B.V.
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Representative: Aalbers, Arnt Reinier
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Decision under appeal: Decision of the Opposition Division of the
European Patent Office posted 4 September 2003
revoking European patent No. 0916426 pursuant
to Article 102(1) EPC.

Composition of the Board:

Chairman: S. Crane
Members: J. Osborne
G. Weiss

Summary of Facts and Submissions

- I. The appeal is directed against the decision posted 4 September 2003 to revoke European patent No. 0 916 426.
- II. The Opposition Division found that the subject-matter of independent claims 1 and 9 as granted was both novel and involved an inventive step in the light of:

D1: JP-A-62 167956

D4: US-A-1 500 261.

The Opposition Division found, however, that the patent specification did not disclose all variants covered by method claim 1 in a manner sufficiently clear and complete for them to be carried out by a person skilled in the art (Article 100(b) EPC).

- III. During oral proceedings held 3 November 2005 the appellant requested that the decision under appeal be set aside and that the patent be maintained as granted (main request) or in the alternative maintained in amended form on the basis of claims submitted as first, second and third auxiliary requests with a letter dated 30 September 2005. The respondent requested that the appeal be dismissed.
- IV. Claims 1 and 9 according to the main request (as granted) read:

"1. A method for forming an end portion of a cylindrical member (4; 40; 41; 42; 43; 400) by spinning, said method comprising the steps of:

- supporting at least one roller (28) to be radially moved to and from a longitudinal central axis (Xr) of a main shaft;
- holding said cylindrical member to position the central axis (Xt) thereof in parallel with said main shaft (21); and
- driving at least one of said cylindrical member and said at least one roller (28) to be rotated relative to each other about the longitudinal central axis (Xr) offset from the central axis (Xt) of said cylindrical member, with said at least one roller (28) radially moved to be in contact with the outer side of one end portion of said cylindrical member, to form a reduced diameter portion (4d; 40d; 41d; 42d; 43d; 400d) on the one end portion of said cylindrical member.

9. An apparatus for forming an end portion of a cylindrical member (4; 40; 41; 42; 43; 400) by spinning, comprising:

- a main shaft (21) positioned on a plane including the central axis (Xt) of said cylindrical member in parallel therewith;
- at least one roller (28) mounted on said main shaft (21) to be radially movable to and from a longitudinal central axis (Xr) of said main shaft, and in contact with the end portion of said cylindrical member;
- first driving means (8, 9) for moving at least one of said cylindrical member and said at least one roller relative to each other, in parallel with the

central axis of said cylindrical member (Xt) and said main shaft (Xr);

- second driving means (22, 25, 26; 15, 16) for moving said at least one roller (28) radially toward said longitudinal central axis (Xr) offset from the central axis (Xt) of said cylindrical member, with said at least one roller (28) being in substantial contact with the outer surface of the one end portion of said cylindrical member, and rotating (22) said at least one roller (28) about said main shaft (21) relative to said cylindrical member; and
- control means (CT) for controlling said first driving means (8, 9) and second driving means (22, 25, 26) to form a reduced diameter portion (4d; 40d; 41d; 42d; 43d; 400d) on the one end portion of said cylindrical member."

Claims 2 to 8 and 10 to 14 define features additional to those of claims 1 and 9 respectively.

- V. The appellant's arguments in respect of sufficiency of disclosure may be summarised as follows:

Method claim 1 defines three variants in respect of providing relative movement between the cylindrical member and the roller during the spinning operation. In the first the cylindrical member is held stationary whilst the roller is rotated around the eccentric axis, in the second and the third the cylindrical member is rotated around the eccentric axis. According to the Opposition Division a "wagging" movement of the formed eccentric portion relative to the roller occurs when the cylindrical member is rotated and the absence of disclosure of details for coping with this was

considered as contrary to the requirements of the EPC. However, "wagging" is not a problem because the rotation of the cylindrical member and therefore also of the eccentric portion takes place around the eccentric axis. The forming method involves the same relative rotation between the cylindrical member and the roller, irrespective of which pieces are actually rotated. Vibration resulting from the rotating cylindrical member is not a problem in practice because of the mass of the machinery.

VI. The respondent's reply in respect of sufficiency of disclosure was essentially as follows:

The underlying purpose of the requirement of sufficiency of disclosure of the invention is to exclude that patent protection be extended to subject-matter which, after reading the patent specification, would still not be at the disposal of the skilled person. Furthermore, the patent monopoly should be justified by the actual technical contribution to the art and the disclosure should not be regarded as sufficient simply because one way of performing the invention was described. In the present case only the simplest of the claimed variants has been disclosed, in which the cylindrical member is held stationary. For each of the remaining variants it is necessary at the commencement of each pass for the cylindrical member to be subjected to radial movement whilst rotating. The features necessary to achieve this have not been disclosed. The appellant refers to the embodiment according to figure 15 of the patent specification in an attempt to show that the method may be performed in the case when multiple passes are necessary. However,

that embodiment is stated to suffer from vibration induced by intermittent contact between the roller and the cylindrical member. The skilled person would never begin with such a disadvantageous embodiment and add further vibration and instability so this cannot provide support for the appellant's case.

VII. As regards novelty and inventive step the respondent essentially argued as follows:

In D1 it is stated that the apparatus may be used for producing various shapes and in figure 4 a cylindrical member is illustrated in which the conically-formed end portion is eccentric with respect to the main body. The eccentricity is not mentioned in the description because the invention relates primarily to the radial adjustment of the rollers. Figure 4 is of "outstanding quality" and the eccentricity on the cylindrical member therefore is to be seen not as an error but as a clear teaching. Moreover, the skilled person is aware that it would be normal to provide height adjustment of the clamp for the cylindrical member, as indeed is illustrated in figure 4, and this would be suitable for providing the eccentric formation of the conical end portion. The subject-matter of claim 9 therefore is not new with respect to D1.

If the subject-matter of claim 1 were to be found novel with respect to the disclosure of D1 by virtue of the feature of the eccentricity it still would be no more than an obvious modification in the light of D4. The patent specification states that the desire already existed to use a spinning operation to produce the eccentric portion of the cylindrical member. D4 teaches

that if it is desired to use spinning to deform an object about an axis other than the main axis the object should be merely rotated about that other axis.

VIII. The appellant's rebuttal of the respondent's attack on novelty and inventive step may be summarised as follows:

As set out in T 970/00 (not published in OJ EPO) it is not correct to interpret the disclosure of the prior art so as to distort or misrepresent it in the light of the present invention. Although it is usual that an apparatus as shown in D1 would be provided with height adjustment of the clamp for the cylindrical member, the teaching of D1 is solely that the clamp would be used to place the cylindrical member concentric with the rollers. When considered in the light of the whole content of D1 it is clear that the eccentricity visible in figure 4 is an error. Claim 9 specifies second driving means for moving the roller toward the longitudinal central axis "offset from the central axis", thereby clearly requiring that the axes not be concentric and addressing the purposive use of the apparatus. Moreover, D4 provides the skilled person with no incentive to provide the claimed offset arrangement because an eccentric position is neither obtained nor changed by the spinning operation.

Reasons for the Decision

1. The patent relates to cylindrical members of sheet metal having a reduced diameter end portion, such as are used for the housings of motor vehicle silencers and catalytic converters. Previously such cylindrical

members when provided with a concentric end portion have been manufactured by pressing the end portion to a nearly conical form which is then finished in a spinning operation. However, manufacture of cylindrical members having end portions eccentric to the main axis previously has involved pressing the end portion and joining it to the main portion. According to the present patent an eccentric end portion may be formed on a cylindrical member by a spinning operation.

Sufficiency of disclosure

2. The contested decision revoked the patent because the Opposition Division considered the disclosure to be insufficient for those two of the three variants covered by method claim 1 in which the cylindrical member is rotated. The problem was considered to result from an eccentricity of the formed portion relative to the main axis arising from the forming operation itself, resulting in a movement termed "wagging". In the final sentence on page 4 of the decision the Opposition Division states: "In order to avoid such a wagging movement it would be necessary also to offset the rotational axis of the cylindrical member from its central axis until the rotational axis coincides with the longitudinal central axis of the formed eccentric portion". However, the wording of claim 1 specifies "driving ... said cylindrical member ... about the longitudinal central axis (X_r) offset from the central axis (X_t) of said cylindrical member". In other words, claim 1 specifies that the cylindrical member always rotates about the eccentric axis so no adjustment to avoid "wagging" would be necessary. Indeed, during the oral proceedings held before the Board the respondent

accepted that since claim 1 specifies that the rotation of the cylindrical member is around the eccentric axis the "wagging" problem which formed the basis of the revocation action would not arise. Nevertheless, the respondent still sees difficulties arising from a need to adjust the radial position of the cylindrical member whilst it is rotating.

- 2.1 The patent specification discloses the concept of performing a plurality of passes in order to achieve a degree of deformation of the cylindrical member which exceeds that to which the material may be subjected in a single pass and the eccentricity of the rotational axis changes with each pass. It discloses with particular reference to figure 6 creating in this way a smoothly tapered surface. As a result of the smooth taper the eccentricity of the end portion changes continuously along its length. In the opinion of the respondent this would necessitate displacing the rotational axis of the rotating cylindrical member not only between passes but also during the initial longitudinal movement of each pass. Whether displacement of the rotational axis of the rotating cylindrical member during a pass would in fact be necessary would depend on such factors as the degree of taper of the end portion, the change in radial dimension per pass and the form of the spinning tool. If indeed for a particular combination of parameters a radial displacement during rotation were necessary, the question prompted by the respondent is whether the skilled person would be capable of putting the method into effect without the need to exercise inventive skill. In particular the respondent considered that there would be a need to disclose splines, a clamp, an

actuator, electrical contact means, a displacement transducer and means for compensating for eccentricity of the centre of gravity of the cylindrical member. However, all of these features are conventional and the Board believes that neither these nor any other features necessary to provide for radial movement of the cylindrical member during its rotation extend beyond the knowledge of the skilled person.

2.2 The standard of disclosure set out in the ground for opposition according to Article 100(b) EPC is "in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art". The Board considers that the skilled person would be capable of putting the method into effect without the burden of exercising inventive skill and that the standard set by the EPC has been reached without the need for a detailed disclosure of the contested variants. In the present case the scope of patent protection therefore has not been extended to subject-matter which, after reading the patent specification, would still not be at the disposal of the skilled person. The technical contribution to the art in the present case relates to the concept of a spinning operation involving eccentric rotational engagement of a cylindrical member. This concept is applicable whether the cylindrical member is rotating or stationary and the extent of the patent monopoly therefore is justified.

2.3 On the basis of the foregoing the Board concludes that the requirements of the EPC in respect of sufficiency of disclosure of the method are satisfied. Claim 9 relates to an apparatus in which only the rollers are rotated and has not led to any objection in accordance

with Article 100(b) EPC by either the respondent or the Opposition Division.

Novelty and inventive step

3. D1 relates to an apparatus for forming the end portion of a cylindrical member into "various shapes" by spinning. The cylindrical member is supported in a clamp and the rollers are supported for rotational engagement with the end portion of the cylindrical member. In figure 4 a cylindrical member illustrated mounted in the apparatus has a tapered end portion. The inventive concept addressed by D1 relates to the radial adjustment of the rollers using a planetary gear arrangement. The respondent considers that D1 discloses all features of the subject-matter of the apparatus claim 9. The appellant is in agreement with the respondent as regards most aspects of the disclosure of D1 and the Board will restrict itself to consideration of the only matter which is the subject of dispute, relating to eccentricity of the end portion relative to the central axis of the cylindrical member.

3.1 In figure 4 of D1 the cylindrical member is shown supported in the clamp with the tapered end portion close to the rollers. As illustrated the end portion of the cylindrical member is somewhat eccentric with respect to the main portion but this is the only indication of any such eccentricity. In particular, D1 is silent as regards the construction of the clamp and the arrangement for the radial adjustment of the rollers, to which the document primarily relates, has no provision for eccentricity. The boards of appeal have developed case law as regards the requirements to

be met when assessing whether a feature shown solely in a drawing forms part of the state of the art. According to T 204/83 (OJ EPO 1985, 310) such features are to be considered as disclosed when a person skilled in the art is able, in the absence of any other description, to derive a technical teaching from them. Moreover, as stressed by the appellant with reference to T 970/00 (*supra*) it is not correct to interpret the disclosure of the prior art so as to distort or misrepresent it in the light of the present patent. The drawing of D1, figure 4 is of good quality but it is not of engineering detail drawing standard and without knowledge of the present patent specification the skilled person would not derive a technical teaching of providing an eccentric end portion, particularly as this is not a common feature in the art of spinning.

- 3.2 The respondent argues that it would be normal to provide in D1 a clamp having adjustment to provide for various diameters of cylindrical member; since the adjustable clamp would be suitable for locating the cylindrical member eccentrically the subject-matter of claim 9 would not be new. However, whilst it may be common to provide a clamp being adjustable for various diameters of cylindrical member it is not necessarily so since a machine may be adapted to accept a single cylindrical member. Such is the case in the patent specification where the vertical clamps shown in the embodiments of figures 2 and 16 have no height adjustment for the lower jaw so that the longitudinal centre-line of a cylindrical member of a particular diameter will always be within the same horizontal plane as the rotational axis of the rollers. Similarly,

the apparatus according to D4 is adapted to mount a particular article.

3.3 It follows from the foregoing that the subject-matter of each of claims 1 and 9 is new.

4. It is acknowledged in the patent specification that it was known to press-form a near-conical concentric end portion of a cylindrical member and then to use a spinning operation to form it into a tapered end portion concentric with the main portion of the cylindrical member. However, it has previously been the practice that when an eccentric arrangement was required this was achieved by assembling two separately fabricated portions, resulting in a higher-cost article having lower strength. The subject-matter of method claim 1 accordingly provides a solution to the problem of forming an eccentric end portion on a cylindrical member having improved mechanical properties and in an economical way. As discussed above, D1 contains no information relevant to the formation of an end portion eccentric to the axis of the main body of the cylindrical member.

4.1 D4 relates to an apparatus for spinning a tubular nose on a cup-shaped sheet metal article at an angle to the main axis of the article. In the preferred embodiment the article is formed initially with a frusto-conical projection eccentrically and angularly positioned relative to the central axis of the main body and the projection is developed into the elongated tubular nose by spinning. The apparatus comprises a platform mounted for rotation about an axis and which locates the article with the frusto-conical projection concentric

with the rotational axis. A mandrel having substantially the same shape as the final shape of the tubular nose is positioned within the projection and a hand tool is used to form the material around the surface of the mandrel.

4.2 The teaching of D4 does not go beyond the prior art acknowledged in the patent specification relating to performing a spinning operation on a press-formed near-conical concentric end portion of a cylindrical member. In both D4 and that acknowledged prior art the spinning operation merely develops the shape of a portion rotating about its own central axis; no eccentricity of parallel axes results from the spinning operation. Indeed, in the embodiment and all of the claims according to D4 the axis of rotation and the longitudinal central axis of the main body are mutually angled. By comparison, according to present claim 1 the spinning operation forms a reduced-diameter end portion as a result of the roller engaging the cylindrical member eccentrically during rotation about an axis parallel to the existing longitudinal central axis of the cylindrical member. It follows that a combination of D1 and D4 would not result in the subject-matter of present claim 1.

4.3 As already set out under 4.2 a combination of D1 and D4 does not contain any teaching relevant to a spinning operation involving rotation about an eccentrically positioned axis parallel to the longitudinal central main axis of a cylindrical member. The skilled person would not be encouraged by this combination of prior art teachings to modify the apparatus of D1 to provide for such offset rotation. Indeed, D4 teaches the use of

a mounting jig specially adapted for that article and to locate it in a concentric position. A combination of D1 and D4 therefore would not lead the skilled person to arrive at the subject-matter of present claim 9 in an obvious way.

5. On the basis of the foregoing the Board concludes that the subject-matter of present claims 1 and 9 involves an inventive step. Since claims 2 to 8 and 10 to 14 contain all features of claims 1 and 9 respectively this conclusion applies equally to those claims.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The patent is maintained as granted.

The Registrar:

The Chairman:

A. Vottner

S. Crane