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D E C I S I O N
of 28 April 1995

Case Number: T 0627/93 - 3.2.4

Application Number: 87112275.0

Publication Number: 0257614

IPC: A01F 15/04

Language of the proceedings: EN

Title of invention:
Reciprocating plunger crop baler having monitoring system for checking uniformity of loaded charges

Patentee:
HESSTON BRAUD (Société Anonyme)

Opponent:
CLAAS OHG

Headword:
Baler/HESSTON BRAUD

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step (yes)"

Decisions cited:
-

Catchword:
-

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Case Number: T 0627/93 - 3.2.4

D E C I S I O N
of the Technical Board of Appeal 3.2.4
of 28 April 1995

Appellant: (Opponent)
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Decision under appeal: **Decision of the Opposition Division of the European Patent Office dispatched on 19 May 1993 rejecting the opposition filed against European patent No. 0 257 614 pursuant to Article 102(2) EPC.**

Composition of the Board:

Chairman: C. A. J. Andries
Members: P. Petti
M. Lewenton

Summary of Facts and Submissions

I. The European patent No. 257 614, containing a first set of Claims 1 to 10 for the Contracting States DE, FR and GB and a second set of Claims 1 to 13 for the Contracting States BE, ES, IT and NL, was opposed on the basis of Article 100(a) EPC.

The opposition, which was mainly based on the documents US-A-4 166 414 (D5) and US-A-4 517 795 (D6), was rejected by the Opposition Division in its decision dispatched on 19 May 1993.

II. The wording of Claim 1 of the patent as granted for the Contracting States BE, ES, IT and NL is as follows:

"A crop baler comprising:

an elongated, fore-and-aft extending baling chamber(20) having a floor (24) provided with an opening (19) across the width of the chamber for admitting successive charges of crop materials into the chamber from the bottom thereof;

means (15) for picking up crop materials from the field as the baler is advanced across the latter and feeding successive charges of the materials up into the baling chamber (20) through said opening (19) to fill the chamber from side-to-side and top-to-bottom with each charge,

said chamber (20) having a restricted discharge opening (17a) at its rearmost end through which completed bales (17) issue from the baler;

a plunger (34) in said chamber generally adjacent the forward end thereof and spanning the chamber from side-to-side and top-to-bottom,

said plunger (34) having drive means associated therewith reciprocating the plunger longitudinally of

the chamber (20) through compression and retraction strokes for packing newly introduced charges of materials rearwardly in the chamber against previously compacted materials and incrementally advancing the compacted materials toward and through the discharge opening (17a); characterized in that it further comprises:

load detection means (36, 36a) associated with said plunger (34) for detecting structural loading at laterally spaced locations of the plunger during compression strokes of the plunger;

output means (46) operably coupled with said load detection means for producing a pair of electrical outputs corresponding to the detected loading of the plunger (34);

control means (51) operably coupled with said output means (46) for comparing the outputs and determining whether the magnitude of one of the outputs exceeds that of the other; and

left and right signal means operably coupled with said control means (51) and responsive to the determination by the control means (51) that the magnitude of one of the outputs exceeds that of the other output for indicating such condition to the operator of the baler to permit corrective steering of the baler and restoration of charges in the bale chamber (20) which are of uniform volume from side-to-side of the chamber."

III. On 7 July 1993 the Opponent (Appellant) lodged an appeal against this decision, simultaneously paid the appeal fee, and filed a statement setting out the grounds of appeal. With the Statement of the Grounds of Appeal the Appellant submitted document DE-C-950 098 (D7).

IV. Oral proceedings were held on 28 April 1995.

V. The Appellant essentially argued that the subject-matter of Claim 1 did not involve an inventive step with respect to document D7, which was considered as the closest prior art, and document D6.

The Proprietor of the patent (Respondent) essentially contested the Appellant's arguments.

VI. The Appellant requests that the decision under appeal be set aside and the patent be revoked.

The Respondent requests that the appeal be dismissed, so that the patent be maintained as granted (main request). It also makes first and second subsidiary requests based on amended claims.

Reasons for the Decision

1. The appeal is admissible.

2. Considerations with respect to the claims

2.1 The broadest independent claim of the patent as granted is considered to be Claim 1 for the Contracting States BE, ES, IT and NL (main request). In the following part of the decision this independent claim will be referred as "Claim 1".

2.2 Claim 1 is directed to a "crop baler". The features specified in Claim 1 make it clear that it relates to a "rectangular crop baler". Furthermore, it is clear from the description of the patent (page 2, lines 10 and 11) that it relates to a "large rectangular baler".

2.3 In the first characterising feature of Claim 1 ("load detection means ... for detecting structural loading at laterally spaced locations of the plunger during compression strokes of the plunger"), the expression "load detection means" must be construed as "means for detecting compressive loading on the plunger", i.e. for detecting a force (see patent description, page 2, lines 45 to 48, as well as page 9, lines 18 to 41 together with Figure 15 which refer to a loading expressed in kilonewton).

The plural form in the expression "spaced locations" implies that such compressive force is detected at least at two spaced locations (see also patent description, page 2, lines 45 to 48). In this context the working of the first characterising feature results in the "pair of electrical outputs" defined by the second characterising feature, in so far as the "electrical outputs" correspond to the loads detected respectively at the "spaced locations".

The purpose of the first and second characterising features of Claim 1 is that of determining a differential in structural loading at said spaced locations caused by unequal volumes of material in the chamber at said spaced locations. This can be derived from the remaining characterising features and from the description (page 2, lines 45 to 54).

The fact that the occurrence of a differential in structural loading must be determined implies that the structural loading at said spaced locations must be continuously detected. In other words, the "load detection means" are suitable for continuously measuring the "structural loading" during the movement of the plunger.

3. *Novelty (main request)*

The subject-matter of Claim 1 is novel with respect to each of the cited documents. This has not been disputed.

4. *The closest prior art*

4.1 Both documents D5 and D7 (as well as the patent in suit) relate to rectangular balers whereas document D6 relates to a round baler.

4.2 Document D5, upon which the precharacterising portion of Claim 1 is based, discloses (see Figures 1 and 5) a crop baler comprising an elongated, fore-and-aft extending baling chamber (14) having a floor provided with an opening (12) across the width of the chamber for admitting successive charges of crop materials into the chamber from the bottom thereof, means (136, 128) for picking up crop materials from the field as the baler is advanced across the latter and feeding successive charges of the materials up into the baling chamber (14) through said opening (12) to fill the chamber from side-to-side and top-to-bottom with each charge, said chamber having a restricted discharge opening (26) at its rearmost end through which completed bales issue from the baler, a plunger (16) in said chamber generally adjacent the forward end thereof and spanning the chamber from side-to-side and top-to-bottom, said plunger (16) having drive means (20, 22) associated therewith for reciprocating the plunger longitudinally of the chamber through compression and retraction strokes for packing newly introduced charges of materials rearwardly in the chamber against previously compacted materials and incrementally advancing the compacted materials toward and through the discharge opening (26).

4.3 Document D7 discloses a crop baler comprising an elongated, fore-and-aft extending baling chamber ("Preßkanal 8") having a floor provided with an opening across the width of the chamber for admitting successive charges of crop materials into the chamber, means ("Pick-up-Aufgreifvorrichtung 5" and "Zubringer 6") for picking up crop materials from the field as the baler is advanced across the latter and feeding successive charges of the materials up into the baling chamber (8) through said opening to fill the chamber from side-to-side and top-to-bottom with each charge, said chamber having a discharge opening at its rearmost end through which completed bales issue from the baler, a plunger ("Kolben 7") in said chamber generally adjacent the forward end thereof and spanning the chamber from side-to-side and top-to-bottom, said plunger having drive means ("Kolbenantriebsräder 15") associated therewith for reciprocating the plunger longitudinally of the chamber through compression and retraction strokes for packing newly introduced charges of materials rearwardly in the chamber against previously compacted materials and incrementally advancing the compacted materials toward and through the discharge opening.

4.3.1 The baler according to document D7 is also provided with means (17, 18; 30, 31) for detecting a critical deformation of mechanical parts of the baler. According to the disclosed specific embodiments these detecting means are associated with the driving means (driving wheel) for determining whether it is overloaded i.e. overloaded in the sense that such an overload is responsible for a critical deformation of the axis of the driving wheels (15). According to the introduction of the description of document D7 (page 2, lines 66 to

76) these critical deformation detecting means can also be associated with other parts of the baler, for instance with the plunger.

Thus, the detecting means are suitable for detecting an overload-deformation of the driving means and must be considered as safety means. The detecting means are not described in document D7 as being suitable for continuously measuring the load acting on the driving means or on the plunger during its movement, but only as means detecting a critical situation, namely a critical deformation. In any case, the idea of determining a differential in structural loading at spaced locations of the plunger caused by unequal volumes of material in the chamber at said spaced locations cannot be derived from document D7, let alone the idea of doing this continuously.

4.3.2 The Respondents submitted that the baler according to document D7 is a so-called Raussendorf rectangular type baler capable of producing bales weighing up to 25 kg. The Appellants did not contest this submission of the Respondents.

The patent in suit however concerns so-called large rectangular balers for which the problem of uneven loading of the bale chamber as described in the patent in suit (page 2, lines 10 to 35) is becoming relevant. The indicated problem therefore points rather to large rectangular balers instead of to balers of the Raussendorf type.

4.4 Having regard to the above sections 2.3 and 4.2 to 4.3.2 the Board does not consider that the baler known from document D7 is closer than the baler known from document D5 to the baler according to Claim 1.

5. *Problem to be solved (main request)*

Having regard to section 4.3, the subject-matter of Claim 1 differs from the prior art known either from document D5 or from document D7 by the features specified in the characterising portion.

These characterising features result in providing the operator with a means for noticing that uneven loading is taking place. Thus, the problem to be solved can be seen as to provide a baler in which the effects of uneven loading may be reduced, i.e. that bales of uniform density may be formed.

6. *Inventive step (main request)*

6.1 Neither document D5 nor document D7 discloses or suggests a teaching pointing to the claimed solution. It should be emphasised once more that the detecting device present in document D7, although being constantly present, only detects the existence of a critical deformation of a machine part, i.e. when the deformation would exceed a certain limit value, so that measures can be taken to avoid the destruction of the machine.

There is no indication in document D7 that two detecting points should be present on the piston (7), let alone two permanently detecting points, let alone two permanently **load** detecting points. The argument that document D7 already discloses the presence of a permanently operating load detection means on the piston, which means can be duplicated, obtaining thereby the subject-matter of Claim 1 can therefore not be accepted.

6.2 Document D6, which relates to the problem of uneven loading, concerns a round baler having an expandable bale forming chamber comprising a plurality of endless conveyors (belts 31 to 37). This known round baler also comprises means (gauges 11 provided with feelers 71/73, 103) for detecting the slackened or tensioned condition of two conveyors (belts 31 and 37), output means (signal transmitting means 83/89) operably coupled with the detection means (71/73) for producing a pair of electrical outputs corresponding to the detected slackened or tensioned condition of the two external conveyors (31/37) and left and right signal means (85/88) operably coupled with output means for indicating that the magnitude of one of the outputs exceeds that of the other, thus permitting corrective steering of the baler and restoration of charges in the bale chamber which are of uniform volume from side-to-side of the chamber.

Thus, document D6 relates to the problem of uneven loading in a round baler having an expandable bale forming chamber formed by a plurality of expandable endless conveyors.

6.2.1 An object of the invention according to document D6 is to provide a baler enabling formation of a cylindrical bale with a more uniform shape and density (see particularly column 2, lines 17 to 19). However, in a round baler according to document D6 attention has to be paid primarily to the shape of the round bale to be formed because lack of uniformity in the shape of such a bale can cause a lack of uniformity in its density. Thus, it is very important that the portions of the bale formed have little difference in diameters. In other words, it is to be avoided that the bales formed have a non-cylindrical shape, for instance a "pear" or an "egg" shape as shown in Figure 2a or 2b of document D6.

In rectangular balers according to either Claim 1 or document D5 or document D7, however, the shape of the bale is already determined by the shape of the walls of the baling chamber and by the single bale plunger spanning the bale forming chamber from side-to-side and top-to-bottom. In such balers more attention has to be paid to the uniformity in the density of the bale to be formed than to its shape which is predetermined.

Thus, the problem of uneven loading in a round baler according to document D6 substantially relates to the uniform cylindrical shape of bales to be formed, whereas the problem to be solved by the baler according to Claim 1 substantially relates to the uniform density of the rectangular bales to be formed.

6.2.2 The belts forming the variable volume bale forming chamber (12) according to document D6 are associated with one belt tensioning and take-up mechanism (68) which is moved responsive to the largest diameter portion of the bale being formed. The position of the belt tensioning and take-up mechanism (68) is defined by the belt engaging the largest diameter portion of the bale. The tension on this belt "is maintained while the tension of the belts engaging the smaller portions is partially or wholly relieved" (see column 7, lines 8 to 17). Therefore, according to document D6, "the slackened or tensioned condition of the belts 34, 42 engaging the bale at two axially spaced locations on the bale periphery" is detected which condition is "indicative of the relative diameter of the bale at the two points" (see column 7, lines 3 to 8).

For a correct operation of the detecting system formed by the gauges (11) according to document D6 it is essential that the bale forming chamber is formed by a plurality of separate parallel expandable bale forming

means, for instance in form of belts. The same detecting system would already be unsuitable for round balers having an expandable baling chamber formed by a single expandable bale forming means, for instance in form of an apron, so that the Appellant's arguments that such a teaching (D6) could be used in other balers cannot be accepted.

The Board therefore is of the opinion that the teaching of document D6 cannot be applied in rectangular balers according to either document D5 or document D7, particularly due to this completely different constructional concept, namely balers provided with a single plunger spanning the bale forming chamber from side-to-side and top-to-bottom.

Even if the skilled person were to try to apply the teaching of document D6 to a rectangular baler according to either document D5 or document D7, he would probably have to modify the structure of the plunger in order to have a plurality of parallel plunger sections such that differences in the stroke of at least two laterally spaced plunger sections can be detected. Moreover, while document D7 discloses a detection of the existence of a critical deformation of a machine part, and while document D6 discloses the measurement of a slackened or tensioned condition of different belts, related to the relative diameters of different bale portions, the Board considers that the combination of their teachings would not result in the subject-matter of the present Claim 1 which defines a direct and permanently load measuring system.

6.3 For the reasons above, the skilled person wishing to develop the bales according to document D7 would not be guided by document D6 to the subject-matter of Claim 1.

Therefore, the subject-matter of Claim 1 involves an inventive step (Article 56 EPC) with respect to the cited documents.

7. The subject-matter of Claim 1 therefore fulfils the requirements of Article 52(1) EPC.

8. The subject-matter of Claim 1 of the patent as granted for the Contracting States DE, FR and GB contains all the features specified in the Claim 1 analysed above (for the Contracting States BE, ES, IT and NL), and therefore also fulfils the requirement of Article 52(1) EPC.

9. The patent can therefore be maintained as granted according to the Respondent's main request. Consequently there is no need to consider the Respondent's subsidiary requests.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

N. Maslin C. Andries