Abstract: A harvester discharge spout outlet control flap arrangement has a first support frame 16 for attachment to an outer end of a harvester discharge spout 10 for detachably supporting first crop deflecting control flap means 14. A second support frame 20 is pivotally mounted on an outer end of the first support frame 16 for detachably supporting second crop deflecting control flap means 15. An actuating means 27 in the form of a hydraulic ram is provided for pivoting the second support frame relative to the first support frame to deflect crop discharge from the outer end of the discharge spout. The first support frame 20 may be pivotally mounted on the outer end of the discharge spout 10 with a linkage 30 connecting the second support frame with the end of the discharge spout so that movement of the second support frame 20 relative to the first support frame 16 by the actuator 27 also moves the first support frame 16 relative to the outer end of the discharge spout 10.
Harvester Discharge Spouts

The invention relates to forage harvesters/or combine harvesters and in particular to control flap arrangements used at the end of discharge spouts of such machines to control the discharge of harvested crop into an accompanying trailer.

Such control flap arrangements are well known but suffer from problems due to replacement necessitated by wear caused by continual impact from the harvested crop.

Furthermore, the geometry of such control flap arrangements must be easily changeable to adapt the crop discharge flow path according the crop harvested. This also requires easy replacement.

It is therefore an object of the present invention to provide an improved control flap arrangement which addresses the above problem.

Thus according to the present invention there is provided a harvester discharge spout outlet control flap arrangement comprising a first support frame for attachment to an outer end of a harvester discharge spout for detachably supporting first crop deflecting control flap means therefrom, a second support frame pivotally mounted on an outer end of the first support frame for detachably supporting second crop deflecting control flap means therefrom, and actuating means for pivoting the second support frame relative to the first support frame to deflect crop discharge from the outer end of the discharge spout.

Preferably the actuator acts directly between the first and second support frames.

Such an arrangement enables the crop deflecting control flap means carried by the first or second support frame to be easily replaced when worn or damaged by impact from the crop etc. by simply detaching the control flap means from the relevant support need to disconnect frame without the any other items. In addition a second crop
deflecting control flap means of a shorter length can be easily replaced with a longer one to adjust the crop discharge flow path.

The first support frame may also be pivotally mounted on the outer end of the discharge spout and a linkage may connect the second support frame with the end of the discharge spout so that movement of the second support frame relative to the first support frame by the actuator also moves the first support frame relative to the outer end of the discharge spout.

A third support frame may also be pivotally mounted on the outer end of the second support frame for detachably supporting a third crop deflecting control flap means therefrom and a further linkage connects the third support frame with the first support frame so that movement of the second support frame relative to the first support frame by the actuator also moves the third support frame relative to the first support frame.

The actuator is preferably a hydraulic cylinder.

Also preferably a sensor is provided to give a signal indicative of the relative angle between he support frames or between one of the support frames and the outer end of the discharge spout to enable the operation of the actuator to be controlled to give a desired crop discharge flow path.

The present invention will now be described, by way of example only, with reference to the accompanying drawings in which:

Figure 1 shows a discharge spout for a forage harvester provided with a spout outlet control flap arrangement in accordance with the present invention;

Figure 2 shows a perspective view of the spout outlet control flap arrangement fitted to the discharge spout of figure 1;

Figure 3 shows a side view of the spout outlet control flap arrangement of figure 2 in the straight configuration;
Figure 4 shows the control flap arrangement of figure 2 in the fully angled position.

Figure 5 shows an extended version of the control flap arrangement of figure 2 in the straight position.

Figure 6 shows the control flap arrangement of figure 5 in the fully angled position.

Referring to the drawings, a forage harvester discharge spout 10 is rotatable as indicated by the arrow R about a substantially vertical axis X by hydraulic motor (not shown).

The discharge spout 10 can also be raised and lowered as indicated by the arrow S by being pivoted by a hydraulic ram 11 about an axis Y which is at right angles to axis X.

The outer end 12 of discharge spout 11 is provided with a control flap arrangement 13 which has a first control flap 14 and a second control flap 15 which can be pivoted relative to each other in order to change the flow path of the crop being discharged from the end of the spout 10.

In accordance with the present invention, the first control flap 14 is supported on a first support frame 16 which is pivoted on a mounting member 17 which is bolted to the end of the discharge spout 10. The first support number 16 is free to pivot relative to the support member 17 about an axis A – A (see figure 2) via pins 18 which extend through downwardly extending ears 19 provided on the first support frame.

Mounted on the outer end of the first support frame 16 is a second support frame 20 which can pivot relative to the first support frame 16 about an axis B - B via pins 21 which extend through a second pair of downwardly extending ears 22 on the first support frame 16.

First control flap 14 is detachably supported below first support frame 16 using nuts and bolts or other detachable fasteners which extend through holes 23 and 24 provided in first frame 16.
Similarly, second control flap 15 is supported from second support frame 20 via detachable nuts and bolts or other fasteners extending through holes 25 and 26 provided on the second support frame.

A double acting hydraulic cylinder 27 extends between a support bracket 28 on first support frame 16 and a second support bracket 29 on second support frame 20. Second support frame 20 is also connected with mounting member 17 via links 30 which are pivotally connected at 31 and 32 with the second support frame 20 and the mounting member 17.

As best seen from figure 4, there is a lever arm Z between the pivot axis B-B and the pivotal connection 31 of link 30 with the second support frame 20. This lever arm ensures that, when the actuator 27 is operated to pivot the second support frame 20 and the second control flap 15 relative to the first support frame 16 and the fist control flap 14, the first support member 16 and associated control flap 14 are also caused to pivot about axis A - A.

Figure 3 shows the position adopted by the support frames 16 and 20 and their associated control flaps 14 and 15 when the cylinder 27 is in its fully retracted position. As can be seen this gives a substantially straight configuration of the two control flaps 14 and 15 relative to each other.

Figure 4 shows the configuration of the control flaps 14 and 15 when the ram 27 is in its fully extended position. This shows the two control flaps in their most relatively pivoted position in which the crop exiting from the spout 10 will be most deflected.

Tension springs 33 are arranged to act between brackets 20a on second support frame 20 and eyes 17a on support member 17. These attention springs take up all the slackness in the pivots and linkage connections and thus reduce vibration and associated noise etc.

As has been indicated earlier, the control flaps 14 and 15 are subject to a high rate of wear due to the impacts of the crop being discharged from spout 10. These flaps thus
require relatively frequent replacements and, because the flaps are easily detachable
from the associated support frames 16 and 20, these flaps can be easily replaced
without the need to disconnect any of the other components of the control flap
arrangement.

In addition the control flap 15 can be easily substituted by a control flap which is
longer or shorter (in direction of crop flow) to adjust the crop discharge flow path.

The control flap arrangement may be provided with a sensor 34 (see Figure 2) which,
for example, has an input arm 35 connected by a link 36 with a pivot pin 37 mounted
one of the holes 24 in one of the downwardly projecting ears 19. This sensor 34
provides an indication of the pivot angle of the first support frame 16 (and hence the
first control flap 14) relative to the mounting member 17. This pivot angle is also
indicative of the pivoting of control flap 15 relative to control flap 14 due to the
presence of the control links 30.

The signal from sensor 34 can therefore be used as an input into a control system for
adjusting the relative angle of control flaps 14 and 15 and thus the discharge path of
the crop being discharged from the spout 10.

Figures 5 and 6 show and extended form of the control flap arrangement shown in
figures 2 to 4 in which a third control flap 40 is mounted on a third support frame 41
which is pivotally mounted on a support structure 42 secured to the outer end of the
second control flap 15 for pivoting about an axis C-C relative to the second control
flap. The third support frame 41 is also connected by a link 50 and pins 51 to the third
support frame 41 and by pins 52 to extended downwardly projecting ears 22 provided
on the first support frame 16. Flap 40 is again secured to frame 41 by nuts and bolts
or other fasteners extending through holes 43 and other holes (not visible in Figures 5
and 6) in the top of frame 41.

Thus in this extended arrangement, when the cylinder 27 is in its fully retracted
position all three control flaps 14, 15 and 40 assume the straight configuration shown
in figure 5 and when the cylinder 27 is extended the control flaps assume a
progressively more curved relative configuration, as shown in figure 6.
Again all three control flaps 14, 15 and 40 can be easily changed when necessary and the angular configuration of all three control flaps is controlled by the single cylinder 27.

Present invention thus provides is simple but effective control arrangement for the control flaps of a forage harvester discharge spout.

As will be appreciated, the invention is also applicable to the discharge spouts of other harvesters such as combine harvesters used to harvest grain or similar crops.
CLAIMS

1. A harvester discharge spout outlet control flap arrangement comprising a first support frame for attachment to an outer end of a harvester discharge spout for detachably supporting first crop deflecting control flap means therefrom, a second support frame pivotally mounted on an outer end of the first support frame for detachably supporting second crop deflecting control of flap means therefrom, and actuating means for pivoting the second support frame relative to the first support frame to deflect crop discharge from the outer end of the discharge spout.

2. A control flap arrangement according to claim 1 in which the actuator acts directly between the first and second support frames.

3. A control flap arrangement according to claim 1 or 2 in which the first support frame is pivotally mounted on the outer end of the discharge spout and a linkage connects the second support frame with the end of the discharge spout so that movement of the second support frame relative to the first support frame by the actuator also moves the first support frame relative to the outer end of the discharge spout.

4. A control flap arrangement according to claim 3 in which a third support frame is pivotally mounted on the outer end of the second support frame for detachably supporting a third crop deflecting control flap means therefrom and a further linkage connects the third support frame with the first support frame so that movement of the second support frame relative to the first support frame by the actuator also moves the third support frame relative to the first support frame.

5. A control flap arrangement according to any one of claims 1 to 4 in which the actuator is a hydraulic cylinder.
6. A control flap arrangement according to any one of claims 1 to 5 in which sensor is provided to give a signal indicative of the relative angle between he support frames or between one of the support frames and the outer end of the discharge spout to enable the operation of the actuator to be controlled to give a desired crop discharge flow path.

7. A harvester discharge spout outlet control flap arrangement connected and arranged substantially as hereinbefore described with reference to and as shown in the accompanying drawings.
## A. CLASSIFICATION OF SUBJECT MATTER

**INV. A01D43/08**

According to International Patent Classification (IPC) or to both national classification and IPC.

### B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

- **A01D**
- **A01F**

Electronic database consulted during the international search (name of database and, where practical, search terms used)

- EPO-Internal, WPI Data

### C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>DE 33 16 325 AI (KLOECKNER HUMBOLDT DEUTZ) AG [DE] 8 November 1984 (1984-11-08)</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>figure 2, page 6, line 8 - page 7, line 10</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>EP 0 672 339 AI (FORD NEW HOLLAND NV [BE]) 20 September 1995 (1995-09-20)</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>figure 6, column 8, line 20 - line 57</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>EP 1 344 446 AI (DEERE &amp; CO [US]) 17 September 2003 (2003-09-17)</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>figure 2, column 4, line 30 - line 32</td>
<td></td>
</tr>
</tbody>
</table>

Further documents are listed in the continuation of Box C.

**X** See patent family annex.

* Special categories of cited documents:

- **A** document defining the general state of the art which is not considered to be of particular relevance.
- **E** earlier document but published on or after the international filing date.
- **L** document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another document or other special reason (as specified).
- **O** document referring to an oral disclosure, use, exhibition or other means.
- **P** document published prior to the international filing date but later than the priority date claimed.

**T** later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention.

**X** document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone.

**Y** document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

**A** document member of the same patent family.

Date of the actual completion of the international search: 4 November 2011

Date of mailing of the international search report: 17/11/2011

Name and mailing address of the ISA:

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

Authorized officer: Al ff, Robert

Form PCT/ISA/210 (second sheet) (April 2005)
<table>
<thead>
<tr>
<th>Patent document cited in search report</th>
<th>Publication date</th>
<th>Patent family member(s)</th>
<th>Publication date</th>
</tr>
</thead>
<tbody>
<tr>
<td>DE 3316325</td>
<td>08-11-1984</td>
<td>DK 221084</td>
<td>05-11-1984</td>
</tr>
<tr>
<td></td>
<td></td>
<td>US 5558282</td>
<td>24-09-1996</td>
</tr>
<tr>
<td>EP 1344446</td>
<td>17-09-2003</td>
<td>CA 2422316</td>
<td>16-09-2003</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DE 10211706</td>
<td>25-09-2003</td>
</tr>
<tr>
<td></td>
<td></td>
<td>US 2003217539</td>
<td>27-11-2003</td>
</tr>
</tbody>
</table>