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(54) Title: COMBINED TRANSMISSION SYSTEM

(57) Abstract: A media rendering recording device (2) of a local network (7), e.g. a DLNA network, is capable of recording live broadcasted media content, the recording being initiated by a media controlling device (3) of the local network, e.g. a DMC of a DLNA network. The media rendering recording device fetches a playlist of available broadcasted media from a media aggregating node (1) outside the local network, the playlist including links to the media content, and forwards to the DMC for display to a user. The user selects a media to record, and the DMC forwards a command with a link to the content to the media rendering recording device.
COMBINED TRANSMISSION SYSTEM

Technical Field

This disclosure generally relates to a transmission system for vehicles, such as off-highway machines. Particularly, this disclosure relates to a transmission system which provides several operating modes. More particularly, the disclosure relates to a transmission system which provides a direct drive mode, a crawler mode, an inching mode, a parking/braking mode and a neutral mode.

Background

Drive systems comprising a planetary gear arrangement and at least two clutch packs are generally known, in particular in embodiments associated with applications for mobile vehicles. Such drive systems may be located within a stationary housing and may include a sun gear connected to an input member, a planetary gear set, a ring gear and at least two clutches which may be spring applied pressure release clutches.

US Patent No. 5,024,636 describes a planetary transmission located into a stationary housing and comprising a sun gear connected with an input member and rotating with it, a planet gear set including a planet carrier connected to an output for the transmission and a ring gear surrounding planet gears. The transmission comprises two spring applied pressure release clutch packs wherein the first clutch pack connects the planet carrier to the sun gear for rotation therewith and the second clutch pack connects the ring gear to the stationary housing. Moreover the transmission system comprises first means, including movable pistons, to disconnect the planet carrier from the sun gear and second means to disconnect the ring gear from the stationary housing. Operation means can alter the operative condition of transmission system according to the invention and provides a selectable ratios, braking and neutral conditions.

US Patent No. 7,537,536 describes a two speed gear box with a central planetary gear mount assembly comprising a sun gear driven by drive shaft, a plurality of planetary gears supported by planetary gear carrier and a ring gear. Moreover it comprises a low speed clutch assembly to selectively activate the ring gear and a high speed clutch assembly to selectively activate the sun gear; these two clutch assemblies are activated by hydraulically powered spring return pistons which are selectively activated to provide the desired operating speed
mode.

The present disclosure is directed, at least in part, to improving or overcoming one or more aspects of the prior art system.

Brief Summary of the Invention

In a first aspect, the present disclosure describes a transmission system, particularly for vehicles, comprising a planetary gear arrangement having a sun gear connected to an input member, a planetary carrier connected with an output assembly and a set of planet gears coupled to a ring gear; a dog clutch assembly to selectively couple the sun gear to the output assembly; and a friction clutch assembly to selectively couple the ring gear to a stationary housing.

In a second aspect, the present disclosure describes a method of operating a vehicle comprising a transmission system provided with a planetary gear arrangement having a sun gear connected to an input member, a planetary carrier connected with an output assembly and a set of planet gears coupled to a ring gear, a dog clutch assembly to selectively couple the sun gear to the output assembly; and a friction clutch assembly to selectively couple the ring gear to a stationary housing, the method comprising selectively engaging and disengaging the dog clutch assembly and the friction clutch assembly for selecting one of driving, crawling, inching, braking operative modes.

Other features and advantages of the present disclosure will be apparent from the following description of various embodiments, when read together with the accompanying drawings.

Brief Description of the Drawings

The foregoing and other features and advantages of the present disclosure will be more fully understood from the following description of various embodiments, when read together with the accompanying drawings, in which:

Fig. 1 is an exploded view of the transmission system according to the present disclosure;

Fig. 2 is a cross-sectional view of the transmission system in the crawling mode according to the present disclosure.

Detailed Description
This disclosure generally relates to a transmission system which provides several operating modes, in particular it may enable a direct drive mode, a crawler mode, an inching mode, a parking/braking mode and a neutral mode.

Figs. 1 and 2 show an embodiment of the transmission system according to the present disclosure. The transmission system, generally indicated as 200, may include a planetary gear arrangement 102 comprising a sun gear 4, a planetary carrier 5, planetary gears 6 and a ring gear 7. The sun gear 4 may be connected with an input member 50, such as a shaft or a gear running from the engine of the machine. The planetary carrier 5 may be connected with an output member or assembly 51.

The transmission system 200 may also include two clutch assemblies: a dog clutch assembly 103 to selectively couple the sun gear 4 to the output assembly 51, and a friction clutch assembly 101 to selectively couple the ring gear 7 to a stationary housing 19.

In an embodiment, the transmission system 200 may be housed inside a containing case 100 which may act both as a container and as a support for the transmission system 200.

The containing case 100 may also house the input member 50.

According to an embodiment of the invention, the transmission system 200 may comprise an input gear 3 which may be connected with the input member 50. A sun gear 4 may be coupled with the input gear 3 such that the sun gear 4 may provide the drive input for the transmission system 200.

The output assembly 51 may comprise an output shaft 8 which may pass through the centre of the sun gear 4 leaving a slack between them so that the rotation of the sun gear 4, meshing directly with the input gear 3, may not cause rotation of the output shaft 8. One end of the output shaft 8 may pass through a bearing cone 2 and may connect to a first output yoke 1 while the other end of the output shaft 8 may have a toothed portion 14 which may connect to a second output yoke 25, at which end there may be a sealing sleeve 23 and a lips seal 24.

The set of planet gears 6 may be supported by the planetary carrier 5. The planet gears 6 may mesh with the sun gear 4.

At its middle portion the output shaft 8 may be connected to the dog clutch assembly 103. The dog clutch assembly 103 comprises a dog clutch spline 9 which may connect with
the output shaft 8 and which dog clutch spline 9 may be inserted inside a dog clutch sleeve 10.

In an embodiment, the dog clutch assembly 103 may be spring applied. A wave spring 11 may be disposed between a cross section of the dog clutch sleeve 10 and the internal walls of a carrier to output shaft connector 12. In this way, the dog clutch sleeve 10 may be spring loaded so as to push the dog clutch sleeve 10 into engagement with the sun gear 4.

The carrier to output shaft connector 12 may be permanently connected with the output shaft 8 for a rotational interconnection thereto.

The carrier to output shaft connector 12 may be connected to the planetary carrier 5 through bolts for stable connection between them. Some bolts may also pass through the centre of planet gears 6 around which the planet gears 6 rotate. The lower part of the carrier to output shaft connector 12 is connected to the output shaft 8 so that the carrier to output shaft connector 12 fixes the planetary carrier 5 with the output shaft 8.

The planet gears 6 are connected to and mesh with the ring gear 7. The ring gear 7 also surrounds and connects with the toothed external profile of the clutch hub 15.

The friction clutch assembly 101 may be connected to the ring gear 7 by the clutch hub 15.

The clutch hub 15 may be connected with a friction plate 39 which may rotate therewith.

The cylindrical body of the clutch hub 15 may comprise splines 36 which may be surrounded by a set of reaction plates 35. These reaction plates 35 may slide on the splines 36 along the axial direction of the cylindrical body of the clutch hub 15 so that the reaction plate 39 may be come reciprocally closer or further. The friction plate 39 may be joined to the clutch hub 15 by splines 36.

[001] Tangs 38 may be attached to the external border of the reaction plates 35. The tangs 38 may be movable along axial direction inside slots 40 of a stationary housing 19 which may house the friction clutch assembly 101. The reaction plates 35 may be locked with the stationary housing 19 by means of tangs 38 inside the slots 40 which thereby prevents rotation of the reaction plates 35.

A pusher plate 17 may be housed inside the stationary housing 19 and which may act
on the reaction plates 35 so as to push each one into contact with the adjacent plate. The
pusher plate 17 may produce the sliding movement of the reaction plates 35 in the slots 40.

The friction clutch assembly 101, which may comprise the set of reaction plates 35
and friction plate 39, may be spring applied. A wave spring 18 may be placed between the
pusher plate 17 and a cross section reduction 37 of the stationary housing 19. The wave
spring 18 may bias the pusher plate 17 against the reaction plates 35. When the reaction
plates 35 are in contact with the friction plate 39, the friction clutch assembly 101 may be in
the engaged condition.

More in details, when the friction clutch assembly 101 is in the engaged condition, the
reaction plates 35, which may be locked to the stationary housing 19, may be pushed together
and stacked such that they may arrive to be in contact with the friction plate 39 associated
with friction clutch hub 15, which may be inserted into the ring gear 7. In this way the
friction clutch assembly 101 may lock the ring gear 7 with the stationary housing 19.

A closing plate 20 may abut on the cross section reduction 37 of the stationary
housing 19. The pusher plate 17 may be movable inside the circular space defined in the
middle of the closing plate 20.

A piston 21 may be axially spaced from the closing plate 20 and the lower part of the
piston 21 may be attached to the base of pusher plate 17.

The housing 19 may be sealed at an end by a cover 22. The cover 22 may be coupled
with the bearing cup 26 which may support the output shaft 8.

In an embodiment, the dog clutch assembly 103 may be hydraulically controlled. A
first fluid passage 27 providing the hydraulic fluid for the dog clutch assembly 103 may
extend through the output shaft 8 and may communicate with a first chamber 30 which may
be defined by the space between the dog clutch spline 9 and the shaft 8.

In an embodiment, the friction clutch assembly 101 may be cooled. A second fluid
passage 28 providing the fluid for the friction clutch assembly 101 may extend through the
output shaft 8 and may communicate into a second chamber 31 which may be defined by the
space between the pusher plate 17 and the carrier to output shaft connector 12.

The operation of the friction clutch assembly 101 may be controlled by a proportional
pressure reducing valve which may vary the pressure of fluid supplying the friction clutch
assembly 101.

More in details, the space comprised between the closing plate 20 and the piston 21 defines a third chamber 32 wherein the fluid for the friction clutch assembly 101 arrives through the third fluid passage 29 located inside the stationary housing 19.

The pressure reducing valve may be connected to the third fluid passage 29 to control the pressure of the fluid inside the third chamber 32 and thereby the disengagement of the pusher plate 17 from the reaction plates 35. The reaction plates 35 may be disconnected from the friction plate 39.

The dog clutch assembly 103 may act in an engagement condition or in a disengagement condition.

In the engagement condition fluid inside the first chamber 30 may not be pressurised which may allow the wave spring 11 to push the dog clutch sleeve 10 toward the sun gear 4 and for engagement thereto.

In the dog clutch assembly 103 disengagement condition, the pressurized fluid in the first chamber 30 may produce a hydraulic pressure which may act against the thrust of the dog clutch wave spring 11. This hydraulic pressure may push the dog clutch sleeve 10 inside the carrier to output shaft connector 12 and to disengage the sun gear 4 from the output shaft 8. So, in this condition, the sun gear 4 may not be directly engaged with the output shaft 8.

The friction clutch assembly 101 may have an engagement condition and a disengagement condition.

In the friction clutch assembly 101 engagement condition there may be not pressurized fluid inside the third chamber 32 so the wave spring 18 may push the pusher plate 17 against the reaction plates 35 to stack these plates 35 against the friction plate 39. As the friction plate 39 may be permanently connected with the clutch hub 15, the ring gear 7 may be locked to the stationary housing 19 via the contact of reaction plates 35 with the friction plate 39.

In the friction clutch assembly 101 full disengagement condition a pressurized fluid inside the third chamber 32 may act against the thrust of the wave spring 18 to move the piston 21 and the pusher plate 17 moved away from the friction plate 39. The reaction plates 35 may space away from the adjacent reaction plates 35 and may not be in contact with the
friction plate 39. So the ring gear 7 may be free to rotate.

Due to the presence of a proportional pressure reducing valve, the friction clutch assembly 101 according to the invention may also have a controlled disengagement condition.

In the controlled disengagement condition the pressure of the fluid through the passage 29 in the chamber 32 may be controlled by the proportional pressure reducing valve. The pressure reducing valve may progressively increase the hydraulic pressure which may act against the thrust of the spring wave friction clutch 18 in order that the disengagement of the stationary housing 19 from the ring gear 7 may be controlled. In this way the reaction plates 35, sliding on the splines 36, may be moved away from the friction plate 39 in a controlled manner so the ring gear 7 may be not locked to the stationary housing 19 but it may slip.

In an alternative the pressure reducing valve may also progressively decrease the hydraulic pressure which may enable the thrust of the spring wave friction clutch 18 to act on the pusher 17 for the controlled engagement of the stationary housing 19 with the ring gear 7. In this way the reaction plates 35, sliding on the splines 36, may be moved toward the friction plate 39 in a controlled manner so the ring gear 7 may be locked to the stationary housing 19. Slipping of the ring gear 7 may occur.

Both dog clutch assembly 103 and the friction clutch assembly 101 may be normally spring applied during the engagement mode while they may be hydraulically pressurized for their disengagement.

In an embodiment, in order to have only two conditions (engagement/disengagement) for the dog clutch assembly 103, the dog clutch valve may be of the on/off type. When the dog clutch valve is closed, there may be no pressurized fluid into the first chamber 30 and the dog clutch assembly 103 may be engaged. When the dog clutch valve is opened, the pressurized fluid in the first chamber 30 may act against the wave spring dog clutch 11 providing disengagement of the dog clutch sleeve 10 from the sun gear 4.

The friction clutch assembly 101 may be controlled by the proportional pressure reducing valve. In particular, the linear part of the pressure reducing range of the valve may be used and it means that the regulation action of the valve may be controlled in such way that the pressure of the fluid, which may act against the thrust of the wave spring friction
clutch 18, may vary linearly.

The proportional pressure reducing valve may be connected with a controller device, for example an electronic control unit (ELU).

The controller device may receive input from the user and it may be suitably programmed to produce output signal which may actuate the proportional pressure reducing valve and the dog clutch valve.

In an embodiment, proportional pressure reducing valve and the dog clutch valve may be both electromechanical valves wherein its opening or closing may be associated to electric current through a solenoid coil. The output signal from the controller device may operate the solenoid of the proportional pressure reducing valve and the solenoid of the dog clutch valve.

The signal provided by the user to the controller device may comprise both on/off signals which may be associated with a switch and signals proportional to the movement of an actuation lever, for example the displacement of a foot pedal.

More particularly, the controller device may translate the signal proportional to the displacement of the foot pedal into an output signal for the proportional reducing valve which may increase linearly and progressively the fluid pressure in the friction clutch chamber 32 so that the friction clutch assembly 101 may be disengaged in a controlled way.

The combination of the engagement and disengagement conditions for the dog clutch assembly 103 and for the friction clutch assembly 101 may provide a transmission system 200 with five different operational modes, particularly they may be a direct drive mode, a crawler mode, an inching mode, a parking mode and a neutral mode.

The direct drive mode may be the normal operating mode of the transmission system 200 wherein no speed reduction is transmitted from the input member 50 to the output member 51. In this operational mode the dog clutch assembly 103 may be in an engagement condition while the friction clutch assembly 101 may be in a disengagement condition.

The crawler mode is the operating mode of the transmission system 200 wherein there is a speed reduction on the output member. In this operational mode the dog clutch assembly 103 may be in the disengagement condition, so no direct drive may be carried to the output member 51, while the friction clutch assembly 101 may be in the engagement condition. In
detail, the sun gear 4 associated with the input member 50 may rotate without a direct connection to the output member 51. The ring gear 7 may be locked to the stationary housing 19, so the planetary carrier 5 associated with the output member 51 may rotate with a reduced speed.

In the inching mode, the dog clutch assembly 103 may be in the disengagement condition while the friction clutch assembly 101 may work in a controlled condition; in particular, the friction clutch assembly 101 disengaging progressively may bring a controlled slip of reaction plates 35 which may provide any speed from the creeper speed to the zero speed.

In the parking mode both the dog clutch assembly 103 and the friction clutch assembly 101 may be in the engagement condition and this operating mode provide a braking function and an emergency stop.

In the neutral mode both the dog clutch assembly 103 and the friction clutch assembly 101 may be in the disengagement condition.

The controller device may receive an input relating to the speed of the output shaft 8 to inhibit the engagement of the crawler mode whilst the machine is moving.

The friction clutch assembly 103 may be disengaged prior to the dog clutch assembly 101 disengagement so that the output shaft 8 may be locked to avoid the roll away of the machine. In detail, if the transmission system 1 is locked by both clutches being engaged with the springs and if either the forwards or reverse clutch in the main transmission is simultaneously engaged, as the friction clutch assembly 103 is disengaged then the machine will pull away without rolling back, that is the main transmission clutch will take up the drive as the friction assembly 103 disengages. This assumes that the main transmission is driven by a torque converter which will prevent the engine stalling.

Industrial Applicability

This disclosure describes a transmission system 200 providing several operating modes for vehicles, particularly for small off-highway machines.

In operation a switch may provide an input to the controller device which may emit output signals for operation of the solenoid of the dog clutch valve and the solenoid of the proportional pressure reduction valve associated with the friction clutch assembly 101.
In direct drive mode, the dog clutch valve may be closed so no hydraulic pressure may be applied to the dog clutch assembly 103 and the dog clutch wave spring 11 may bias the dog clutch sleeve 10 to engage the sun gear 4 to lock this latter with the planetary gear carrier 5. The proportional pressure reducing valve may be fully opened so that the hydraulic pressure of the fluid may disengage the friction clutch assembly 101. As a result of locking the sun gear 4 to the planetary gear carrier 5, the gear ratio between the input member 50 and the output member 51 may be 1:1 so there may be no speed reduction between the input and output.

In the crawler mode, the proportional pressure reducing valve may be fully closed so the hydraulic pressure may be released from the friction clutch assembly 101 for the engagement by means of the friction clutch wave spring 11; the dog clutch valve may be opened so the hydraulic pressure may be applied to the dog clutch assembly 103 to disengage it. In this way the output shaft 8 may be driven by the planetary gear carrier 5 so a speed reduction may be achieved.

When the transmission system 200 is in the crawler mode, the user by means of his/her action on the foot pedal may control the inching mode. The controller device may translate the signal provided by the user pushing down the foot pedal into a command to the solenoid of the proportional pressure reduction valve associated with the friction clutch assembly 101. This valve progressively may increase the pressure in the friction clutch assembly 101 so that it may progressively disengage. The slippage of the reaction plates 35 may provide the inching function which enables the slow movement of the off-highway machine forward or backwards for a short distance in an easily controllable manner.

When the foot pedal reaches the bottom of its travel, the dog clutch assembly 103 may be engaged and, after a short interval, the friction clutch assembly 101 may be engaged and simultaneously the input transmission clutch may be disengaged by the engine so that the parking brake mode may be achieved. Upon releasing the foot pedal, the friction clutch assembly 101 may be disengaged and then the dog clutch assembly 103 may be re-engaged and the input transmission clutch may be re-engaged with the engine.

To pass from the direct drive mode to the parking mode, the dog clutch assembly 103 may be already engaged while the friction clutch assembly 101 may be engaged.
To pass from the crawler or inching mode to the parking mode, firstly the friction clutch assembly 101 may be momentarily disengaged, secondly the dog clutch assembly 103 may be engaged and finally the friction clutch assembly 101 may be re-engaged.

When both the dog clutch assembly 103 and the friction clutch assembly 101 are disengaged, the transmission system 200 may be in the neutral mode and this mode may be suitable for the attachment of a power-take-off (PTO) to be driven by the transmission system 200 while the machines wheel are disconnected.

Thus, the transmission system according to the invention may enable the combination of five different operating modes into a single drive assembly unit, thereby may save space and may enable it to be fitted into small mechanical transmissions.

Moreover, particularly in small off-highway machines, the transmission system according to the invention may enable to inch the vehicle forward or backward over a short distance in an easily controllable manner. Further, the transmission system according to the invention may enable in the crawler mode the movement of the vehicle at low output speed but with high engine input speed to enable an attachment to be driven with full power. The transmission system according to the invention may enable fail safe parking and a secondary brake.

By suitable control of the input transmission clutches a hill start feature may be engineered.

The industrial applicability of the transmission system as described herein will have been readily appreciated from the foregoing discussion.

Accordingly, this disclosure includes all modifications and equivalents of the subject matter recited in the claims appended hereto as permitted by applicable law. Moreover, any combination of the above-described elements in all possible variations thereof is encompassed by the disclosure unless otherwise indicated herein.

Where technical features mentioned in any claim are followed by references signs, the reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, neither the reference signs nor their absence have any limiting effect on the technical features as described above or on the scope of any claim elements.

One skilled in the art will realise the disclosure may be embodied in other specific
forms without departing from the disclosure or essential characteristics thereof. The foregoing embodiments are therefore to be considered in all respects illustrative rather than limiting of the disclosure described herein. Scope of the invention is thus indicated by the appended claims, rather than the foregoing description, and all changes that come within the meaning and range of equivalence of the claims are therefore intended to be embraced therein.
CLAIMS

1. A transmission system (200), particularly for vehicles, comprising:
   a planetary gear arrangement (102) having a sun gear (4) connected to an input
   member (50), a planetary carrier (5) connected with an output assembly (51) and a set of
   planet gears (6) coupled to a ring gear (7);
   a dog clutch assembly (103) to selectively couple the sun gear (4) to the output
   assembly (51); and
   a friction clutch assembly (101) to selectively couple the ring gear (7) to a stationary
   housing (19).

2. The transmission system (200) according to claim 1 wherein it comprises a regulator
to variably control the application of the ring gear (7) to the stationary housing (19).

3. The transmission system (200) according to claim 1 wherein the regulator is a
proportional pressure reducing valve arranged between the friction clutch assembly
(101) and a control device.

4. The transmission system (200) according to claim 1 wherein the linear part of pressure
range of the proportional pressure reducing valve is used by the control device to
operate the friction clutch assembly.

5. The transmission system (200) according to any of the preceding claims wherein the
controller device provides a command to the proportional pressure reducing valve
which is related to a signal provided by a user.

6. The transmission system (200) according to claim 5 wherein the signal provided by the
user is the travel of a foot pedal.

7. The transmission system (200) according to claim 5 or 6 wherein the dog clutch
assembly (103) is hydraulically controlled by a dog clutch valve of on/off type and
commanded by the controller device.

8. The transmission system (200) according to any of the preceding claims wherein:
   - a braking mode is provided when the dog clutch assembly (103) and the friction clutch assembly (101) are engaged;
   - a crawler mode is provided when the dog clutch assembly (103) is disengaged and the friction clutch assembly (101) is fully engaged; and
   - an inching mode when the dog clutch assembly (103) is disengaged and the friction clutch assembly (101) is partially disengaged controlling the regulator.

9. The transmission system (200) according to any of the preceding claims further comprising a direct drive operative mode wherein the dog clutch assembly (103) is engaged and the friction clutch assembly (101) is fully disengaged.

10. A vehicle comprising a transmission system (200) according to anyone of the proceeding claims.

11. A method of operating a vehicle comprising a transmission system (200) provided with a planetary gear arrangement (102) having a sun gear (4) connected to an input member (50), a planetary carrier (5) connected with an output assembly (51) and a set of planet gears 86) coupled to a ring gear (7), a dog clutch assembly (103) to selectively couple the sun gear (4) to the output assembly (51); and a friction clutch assembly (101) to selectively couple the ring gear (7) to a stationary housing (19), the method comprising selectively engaging and disengaging the dog clutch assembly (103) and the friction clutch assembly (101) for selecting one of driving, crawling, inching, braking operative modes.

12. The method of claim 11, comprising selecting the driving mode by:
   - engaging the dog clutch assembly (103); and
   - disengaging the friction clutch assembly (101).
13. The method of claim 11, comprising selecting the crawling mode by:
- disengaging the dog clutch assembly (103); and
- fully engaging the friction clutch assembly (101).

14. The method of claim 11, comprising selecting the inching mode by:
- disengaging the dog clutch assembly (103); and
- partially disengaging the friction clutch assembly (101) to cause proportional slipping of the friction clutch.

15. The method of claim 11, comprising selecting the braking mode by:
- engaging the dog clutch assembly (103); and
- fully engaging the friction clutch assembly (101).
INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2010/068493

A. CLASSIFICATION, OF SUBJECT MATTER

INV. F16H3/54
ADD.

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)
F16H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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

EP0—Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
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<td>paragraphs [0017] - [0019], [0030], [0033], [0048] - [0050], [0058] - [0061]; figure 3</td>
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Further documents are listed in the continuation of Box C.

'X' 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

'Y' document of particular relevance; the claimed invention cannot be considered as novel or cannot be considered to involve an inventive step when the document is taken alone

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Date of the actual completion of the international search
10 January 2011

Date of mailing of the international search report
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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
Schreck, Mathias

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