

(19)



(11)

EP 2 077 356 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:

08.07.2009 Bulletin 2009/28

(51) Int Cl.:

E02F 9/00 (2006.01)

F16L 3/00 (2006.01)

E02F 3/36 (2006.01)

(21) Application number: **07425848.4**

(22) Date of filing: **31.12.2007**

(84) Designated Contracting States:

**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IS IT LI LT LU LV MC MT NL PL PT RO SE
SI SK TR**

Designated Extension States:

AL BA HR MK RS

(71) Applicant: **New Holland Kobelco Construction
Machinery S.p.A.**

10099 San Mauro Torinese (IT)

(72) Inventors:

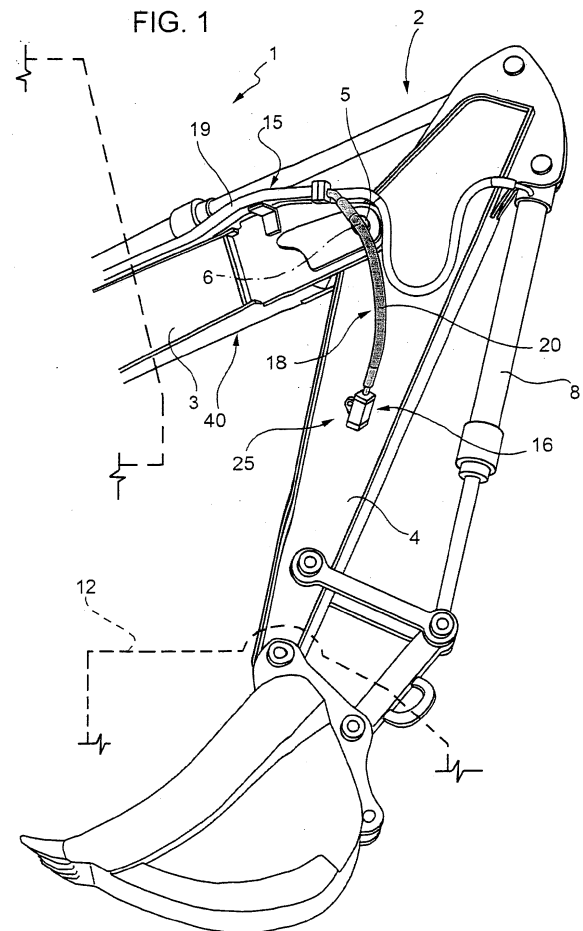
- **Viretto, Mauro**
10090 Trana (IT)
- **Luchetti, Gianni**
10078 Venaria Reale (IT)

(74) Representative: **CNH IP Department**

CNH Belgium NV
Patent Department
Leon Claeyssstraat 3A
8210 Zedelgem (BE)

(54) **Articulated arm for machines**

(57) An articulated arm (2) of a machine (1) has an additional hydraulic circuit (15) for feeding hydraulic fluid to accessory implements (12) connectable to the articulated arm (2); the additional hydraulic circuit (15) having an additional hydraulic pipe (18), and a hydraulic connecting valve (16) connected hydraulically to the hydraulic pipe (18) and mechanically to a rotary elongated portion (4) of the arm by a hinge device (30), which allows the connecting valve (16) to rotate about a rotation axis (31) with respect to the elongated portion (4), as the elongated portion (4) rotates.



EP 2 077 356 A1

Description

[0001] The present invention relates to an articulated arm for machines in general, and for excavators in particular.

[0002] As is known, excavators comprise an articulated arm, an elongated end portion of which is hinged at one end to an intermediate connecting portion of the articulated arm, and is fitted at the other end with a bucket. To enhance the versatility of the machine, the bucket of most excavators is replaceable with accessory implements, such as wrecking devices, grippers, etc., which, however, require an additional hydraulic connecting point for connection to the hydraulic control system of the excavator. For this purpose, the arm has an additional hydraulic circuit comprising a feed pipe, and a hydraulic connecting valve for connecting the accessory implements. The hydraulic connecting valve is connected integrally to the elongated end portion by a supporting bracket connected firmly to the connecting valve and to the end portion by means of screws.

[0003] The pipe is connected at one end to the user-operated hydraulic distributor, and at the other end to the hydraulic connecting valve, and comprises, at the hinge point between the end and intermediate portions of the arm, a length of hose made of elastomeric material, terminating at the hydraulic connecting valve, and designed to form a number of elastically deformable loops.

[0004] Though widely adopted, additional hydraulic circuits of the type described above are unsatisfactory, both in terms of efficiency and reliability, and the potentially high maintenance cost involved.

[0005] This is mainly due to the way in which the hydraulic connecting valve is connected to the arm requiring the use of relatively long hoses to enable the end portion to rotate with respect to the intermediate supporting portion, and to prevent overly stressing the pipe.

[0006] The hoses used, however, normally project beyond the bottom edge of the articulated arm, with the result that, when the arm is operating in the lowered position, the hose often knocks against, drags along, or is caught up by the material being removed, thus resulting in rapid wear of the hose and, at times, even severing of the hose when the arm is raised.

[0007] The forces transmitted to the hoses often inevitably result, even after a relatively short time, in hydraulic fluid leakage at the joints between the hose and connecting valve, and between the hose and the rest of the pipe upstream from the hose, with the result that the hydraulic fluid level must be monitored constantly and topped up regularly.

[0008] It is an object of the present invention to provide an articulated arm for machines, designed to provide a straightforward, low-cost solution to the above problems.

[0009] According to the present invention, there is provided an articulated arm for machines, comprising at least one elongated portion hinged to rotate about a hinge axis with respect to an adjacent connecting portion; and

an additional hydraulic circuit for feeding hydraulic fluid to accessory implements connectable to the articulated arm; said additional hydraulic circuit comprising hydraulic connecting valve means for hydraulically connecting said accessory implements, and connecting means for connecting said connecting valve means to said elongated portion; **characterized in that** said connecting means comprise hinge means to permit rotation of said connecting valve means about a rotation axis parallel to said hinge axis.

[0010] The hinge means of the articulated arm defined above preferably comprise a bracket connected integrally to said connecting valve means; and a hinge pin extending through said bracket coaxially with said rotation axis and connected integrally to said elongated portion.

[0011] Said additional hydraulic circuit preferably also comprises a flexible pipe portion extending at least partly at said hinge axis; said flexible pipe portion being located inside a space defined at the bottom by a surface parallel to said hinge axis and through a bottom peripheral edge of said arm, regardless of the operating position of said elongated portion.

[0012] A non-limiting embodiment of the invention will now be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a partial side view in perspective of a preferred embodiment of a machine articulated arm in accordance with the teachings of the present invention;

Figure 2 shows the same view as in Figure 1, of the Figure 1 arm in a different operating position;

Figure 3 shows a larger-scale section along line III-III.

[0013] Number 1 in Figure 1 indicates as a whole a machine, in particular a self-propelled earthmoving machine. Machine 1 comprises a known articulated arm 2, in turn comprising an elongated intermediate connecting portion 3, and an elongated end portion 4. Elongated end portion 4 is hinged to elongated intermediate portion 3 by a hinge pin 5 to rotate, with respect to intermediate portion 3, about a substantially horizontal hinge axis 6 perpendicular to elongated portions 3 and 4. A bucket 7 is hinged to a free end of elongated end portion 4, is operated by a respective hydraulic jack 8 connected to a main hydraulic circuit 9 of the machine, and may be replaced with accessory implements, such as wrecking devices, grippers, etc., shown schematically and indicated as a whole by 12, to perform different operations with the same machine.

[0014] With reference to the accompanying drawings, accessory implements 12 are operated by respective hydraulic actuators (not shown) connected hydraulically to an additional hydraulic circuit indicated as a whole by 15.

[0015] Additional hydraulic circuit 15 is fitted at least partly to elongated portions 3 and 4, and comprises a connecting valve 16 fitted to elongated end portion 4; and

a hydraulic-fluid feed pipe 18 connected at one end in known manner to a known user-operated hydraulic distributor (not shown), and at the other end to an inlet of connecting valve 16.

[0016] Feed pipe 18 comprises a rigid portion 19 extending along, and connected firmly in known manner to, intermediate portion 3; and a flexible end portion 20, defined by a hose, which extends at hinge axis 6, and is connected in fluidtight manner at one end to rigid portion 19, and at the other end directly to the inlet of connecting valve 16.

[0017] With reference to Figure 3, connecting valve 16 comprises an outer casing 22 connected firmly, e.g. by means of screws 23, to one leg 24 of an L-shaped supporting bracket 25, the other leg 26 of which extends parallel to and facing a lateral wall 27 of elongated end portion 4, and is connected to lateral wall 27 by a hinge assembly 30 to enable rotation of bracket 25, and therefore of connecting valve 16, about a fixed hinge axis 31 parallel to axis 6.

[0018] With reference to Figure 3, hinge assembly 30 comprises a nut screw 33 fitted firmly, e.g. welded, to and projecting from lateral wall 27 coaxially with axis 31; and a screw 34. Screw 34 comprises a threaded shank 35, an end portion of which is screwed inside nut screw 33, and a portion of which, extending from head 36 of the screw, extends through a collar or ring 37 forced by head 36 of the screw against nut screw 33. Collar 37 engages in rotary manner a through hole formed in leg 26, and is of a length, measured parallel to axis 31, approximately equal to but no less than the thickness of leg 26, so that bracket 25 rotates freely with respect to screw 34 and collar 37.

[0019] In actual use, hinge assembly 30 allows connecting valve 16 to rotate about axis 31 with respect to end portion 4 of the arm, as end portion 4 rotates with respect to intermediate portion 3. Allowing valve 16 to rotate reduces the forces exerted on both hose 20 and the joints connecting hose 20 to rigid portion 19 and connecting valve 16, thus prolonging the working life of both hose 20 and the joints, and so reducing hydraulic fluid leakage and losses.

[0020] Moreover, as shown in Figures 1 and 2, by allowing connecting valve 16 to move with respect to elongated portion 4 of the arm to which it is connected, the length of hose 20 can be reduced considerably as compared with known solutions, so that hose 20 remains completely facing the arm, regardless of the relative position of elongated portions 3 and 4. In other words, regardless of the angular position of end portion 4 with respect to intermediate portion 3, hose 20 remains at all times inside a space defined at the bottom by a surface parallel to axes 6 and 31 and through a bottom edge 40 of arm 2. That is, hose 20, by never coming into contact with the material or ground below the arm, operates in the best working conditions at all times, with no impairment in its original characteristics and, hence, original efficiency and reliability.

[0021] Clearly, changes may be made to arm 2 as described herein without, however, departing from the scope as defined in the accompanying Claims. More specifically, connecting valve 16 may be supported by brackets or fastening members other than the bracket described; and hinge assembly 30 may be formed differently from the one shown by way of example, while still allowing at least one rotation of connecting valve 16 with respect to the elongated portion to which it is connected.

[0022] Moreover, arm 2 as described herein may obviously form part of any machine other than the earthmoving machine described by way of example. In fact, the same problems referred to specifically in connection with earthmoving machines are obviously also encountered in other types of machines featuring articulated lifting, resisting, or supporting arms.

Claims

1. An articulated arm for machines, comprising at least one elongated portion hinged to rotate about a hinge axis with respect to an adjacent connecting portion; and an additional hydraulic circuit for feeding hydraulic fluid to accessory implements connectable to the articulated arm; said additional hydraulic circuit comprising hydraulic connecting valve means for hydraulically connecting said accessory implements, and connecting means for connecting said connecting valve means to said elongated portion; **characterized in that** said connecting means comprise hinge means to permit rotation of said connecting valve means about a rotation axis parallel to said hinge axis.
2. An arm as claimed in Claim 1, **characterized in that** said hinge means comprise a bracket connected integrally to said connecting valve means; and a hinge pin extending through said bracket coaxially with said rotation axis and connected integrally to said elongated portion.
3. An arm as claimed in Claim 2, **characterized in that** said bracket comprises a plate portion having a through hole; and **in that** said hinge means also comprise a collar fitted to said hinge pin and locked by the hinge pin to said portion; said collar engaging said through hole in rotary manner, and being of a length, measured in a direction parallel to said rotation axis, approximately equal to but no less than the thickness of said plate portion measured in the same direction.
4. An arm as claimed in any one of the foregoing Claims, **characterized in that** said additional hydraulic circuit also comprises a flexible pipe portion extending at least partly at said hinge axis; said flexible pipe portion being located inside a space defined

by a surface parallel to said hinge axis and through a bottom peripheral edge of said arm, regardless of the operating position of said elongated portion.

5

10

15

20

25

30

35

40

45

50

55

FIG. 1

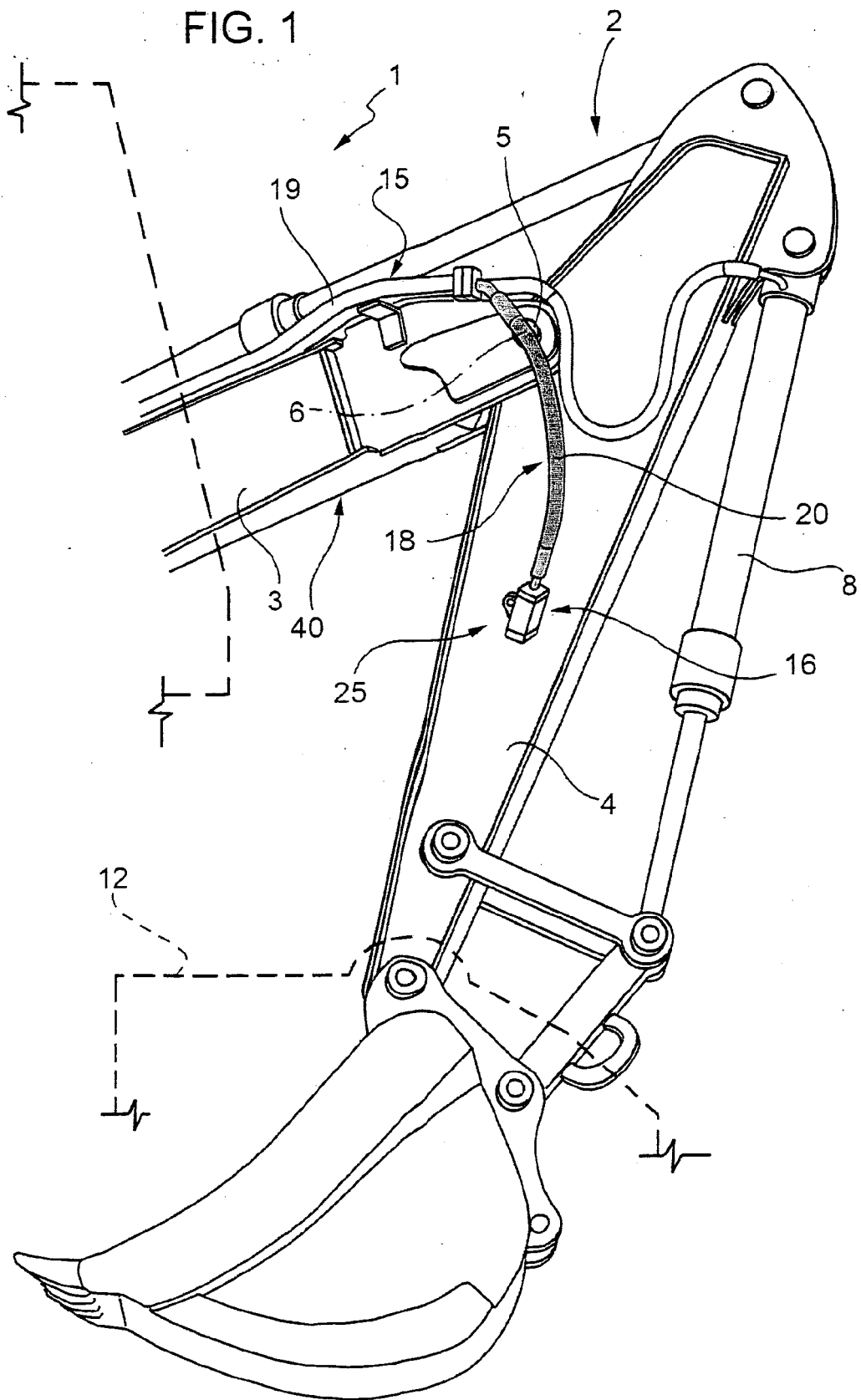


FIG. 2

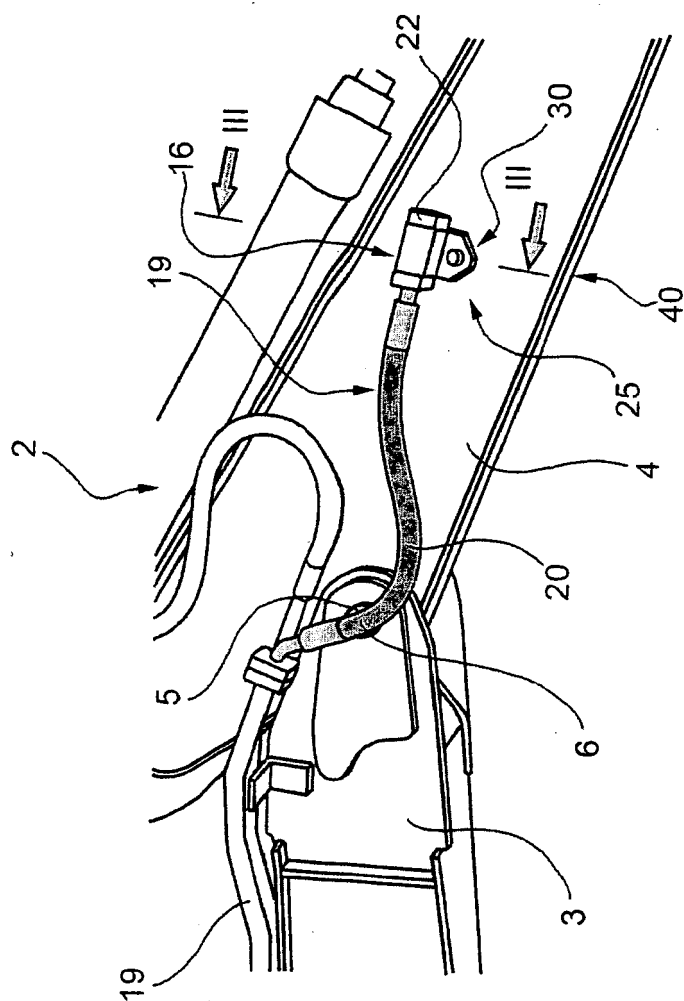
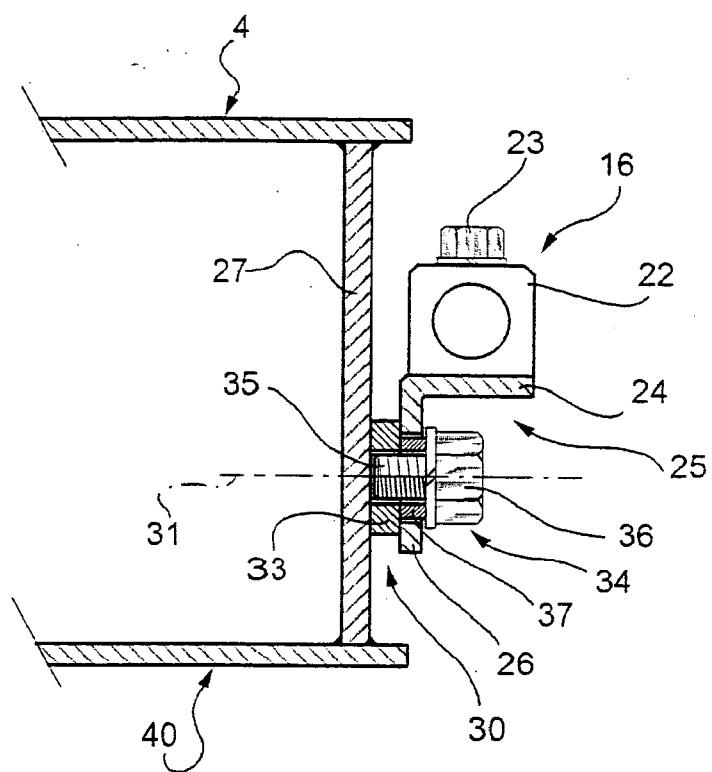


FIG. 3





DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	JP 2002 013160 A (NIPPON SHARYO SEIZO KK) 18 January 2002 (2002-01-18)	1	INV. E02F9/00 F16L3/00 E02F3/36
Y	* abstract; figures 1,2,4,6,7 *	2,3	
Y	JP 2002 250047 A (HITACHI CONSTRUCTION MACHINERY) 6 September 2002 (2002-09-06) * abstract; figures 1,4 *	2,3	
A	DE 40 07 470 C1 (O & K ORENSTEIN & KOPPEL AG, 1000 BERLIN, DE) 7 March 1991 (1991-03-07) * figures 3,4 *	1	
A	US 4 304 077 A (MULLER THOMAS P) 8 December 1981 (1981-12-08) * abstract; figures 1,4,5 *	1	
A	JP 2001 081808 A (KOBELCO CONSTR MACHINERY LTD; KOBE STEEL LTD) 27 March 2001 (2001-03-27) * figure 3 *	1	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			E02F F16L F16B E05D
Place of search		Date of completion of the search	Examiner
Munich		27 May 2008	Bultot, Coralie
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 07 42 5848

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

27-05-2008

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
JP 2002013160	A	18-01-2002	JP 3535079 B2	07-06-2004
JP 2002250047	A	06-09-2002	NONE	
DE 4007470	C1	07-03-1991	NONE	
US 4304077	A	08-12-1981	CA 1122954 A1	04-05-1982
			JP 1037633 B	08-08-1989
			JP 56500860 A	25-06-1981
			SE 450854 B	03-08-1987
			SE 8100417 A	30-03-1981
			WO 8100273 A1	05-02-1981
JP 2001081808	A	27-03-2001	JP 3443373 B2	02-09-2003

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82