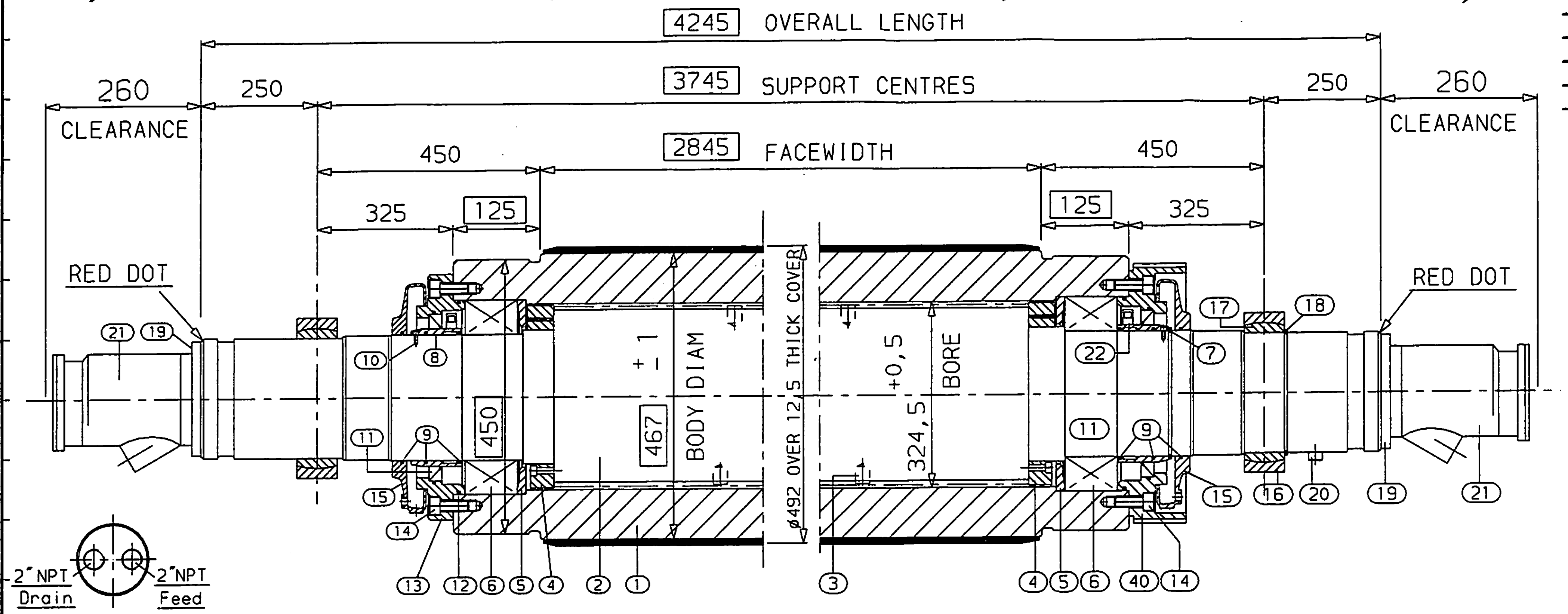
C 76423

REF.	MATERIAL	No. OFF
		4



REF	DRG NO	DESCRIPTION	REF	DRG NO	DESCRIPTION	REF	DRG NO	DESCRIPTION	REF	DRG NO	DESCRIPTION
1	C76219	OUTER SHELL	8	C73172	WIPER RING	15	C76421	DRIP RING			
2	A73169 turning / A76419 drilling	CENTRE SHAFT	9		'O'RING 4mm DIA CORD	16	C73174	OUTER SPHERICAL			
3	C73186	NYLON BUSH	10		CAP SCREW 1/4"UNCx1/2"	17	C73175	INNER SPHERICAL			
4	C76424	SEAL HOUSING ASS'Y	11		Oil seal GARLOCK REF:64x3984 9 1/2"x 11 1/2"x 13/16"	18		EXT'L CIRCLIP Ø210x5			
5	C73173	SEAL RUBBING RING	12		'O'RING 5mm DIA CORD	19	C72746	REGULATOR FLANGE			
6		spherical roller bearing No 23044 CC/C08	13	C76420	END FLANGE	20		CAP SCREW 5/8"UNC x 1"	40	C76426	100T END FLANGE
7		EXT'L CIRCLIP Ø220x5	14		CAP SCREW 3/4"UNC x 2"	21	3,67:1	DIFFERENTIAL REGULATOR	22	C73187	OIL SCOOP

MACHINING SYMBOLS UNLESS OTHERWISE STATED
ROUGH ▽ (<10μm)
MEDIUM ▽▽ (<2,5μm)
FINE ▽▽▽ (<0,63μm)

ALL BURRS AND SHARP EDGES TO BE REMOVED UNLESS OTHERWISE STATED

Tolerances for dimensions to machined surfaces not otherwise toleranced.

Nominal Size mm	over 6 up to 30	over 30 up to 120	over 120 up to 315	over 315 up to 1000	over 1000 up to 2000	over 2000 up to 4000	over 4000 up to 8000	over 8000 up to 12000	over 12000 up to 16000
	±0,2	±0,3	±0,5	±0,8	±1,2	±2	±3	±4	±5

	REVISION	DATE	SIG.
C			
B			
A			

HUNT & MOSCROP

SECTIONAL ARRANGEMENT OF SWIMMING ROLL TYPE:23044HM

DRAWN PSH
CH'KD PSH
DATE 200691
SCALE
PROJECTION

JOB NUMBER 11604100010

C.76423

The Swimming roll system

Pages 1 to 5 of STD\0004\S\A005-A

1. Introduction

The Hunt & Moscrop Swimming roll system features real–time, roll deflection control for applications where uniform pressure is to be constantly maintained across the roll nip. The main components of this system are the Swimming roll(s) and the control unit.

2. Construction and basic principles of the Swimming roll (Fig 1)

The two main components of the Swimming roll are the centre shaft and the outer shell. A spherical roller bearing assembly is located within each end of the shell. In operation the shaft remains stationary while the shell freely rotates on the roller bearings. The annular space between the shaft and the shell is divided into two chambers by longitudinal seals which are mounted along the full length of the shaft.

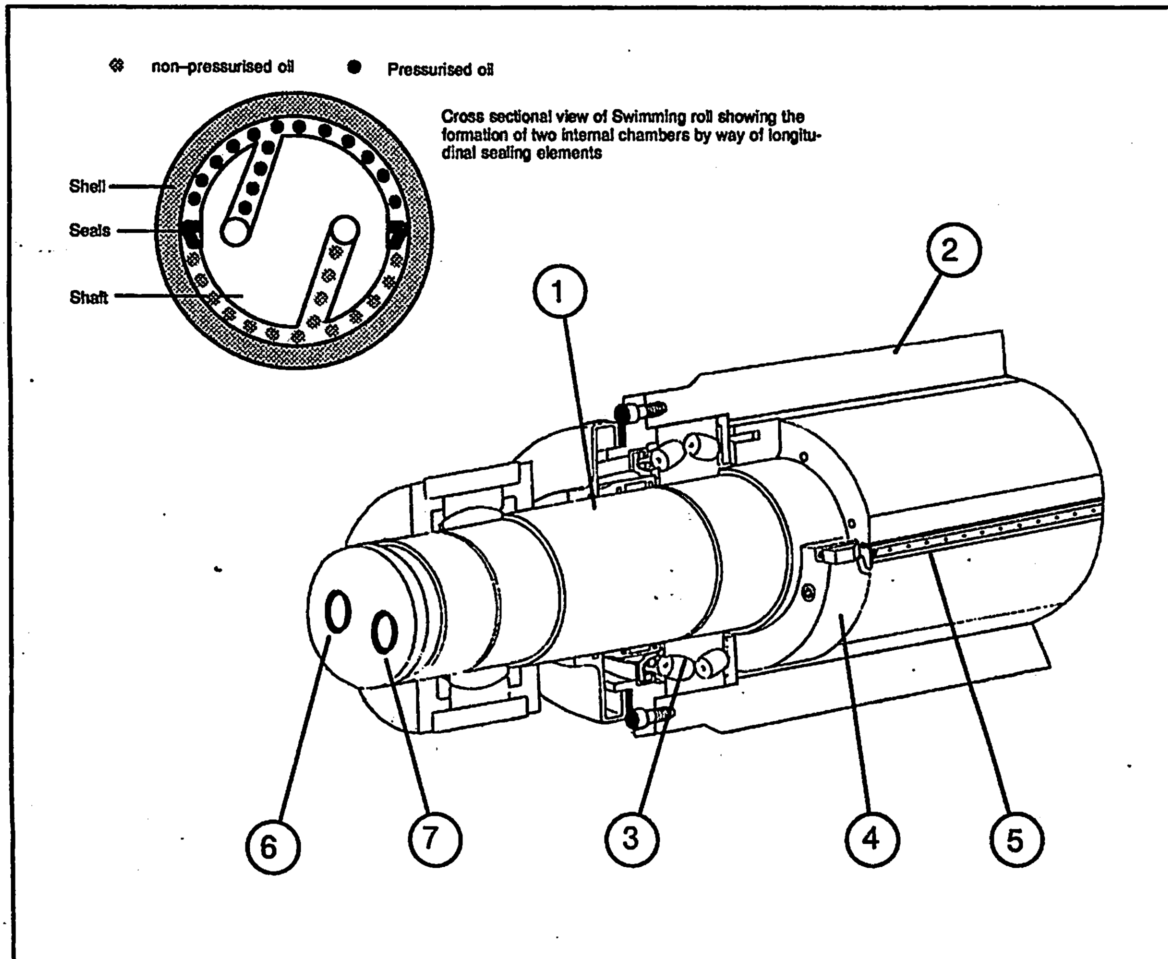


Fig 1

Key to illustration

ITEM	(1)	Centre shaft	ITEM	(2)	Outer shell
ITEM	(3)	Roller bearings	ITEM	(4)	End seal support ring
ITEM	(5)	Longitudinal seals	ITEM	(6)	Oil inlet port (feed)
ITEM	(7)	Oil outlet port (drain)			

Shell deflection is achieved by loading the Swimming roll pressure chamber. This is done by pumping oil into the shaft via the inlet port (feed) on the shaft end. From the inlet port the oil passes through the feed bore within the shaft body and on into the pressure chamber. The oil exerts a force between the shaft and the shell and causes them to deflect, the amount of deflection being directly proportional to the oil pressure. Effectively, the shell is kept floating on oil.

The shaft mounted longitudinal seals are spring loaded so that their contact with the bore of the shell is maintained when the shaft is deflected. This ensures that the efficiency of the pressure chamber is unaffected during roll operation. The seals are arranged so that a certain amount of oil is able to pass into the non–pressurised chamber to provide essential lubrication for the seals and bearings. This oil is returned to the oil reservoir via the outlet port (drain) on the shaft end.

Adequate lubrication for the internal components is vital therefore the Swimming roll is at least half full of oil under all operating conditions. The lubricant in the assembly is contained by end seals which are enclosed within the end seal housing.

3. The Swimming roll in operation (Fig 2)

For the following example, consider a two roll calender with a Swimming roll fixed in the bottom position (i.e. pressure chamber in top position) and a top, externally loaded mating roll. Fig 3 details the nip profile, the extent of the deflection of the rolls has been exaggerated for illustration purposes.

In example A, the mating roll is made to deflect upwards because of the force exerted on its edges by the external loading system In this case there is no hydraulic pressure being applied to the Swimming roll therefore it deflects in the opposite direction to the mating roll (negative deflection). The result of this is an unequal nip pressure across the sheet.

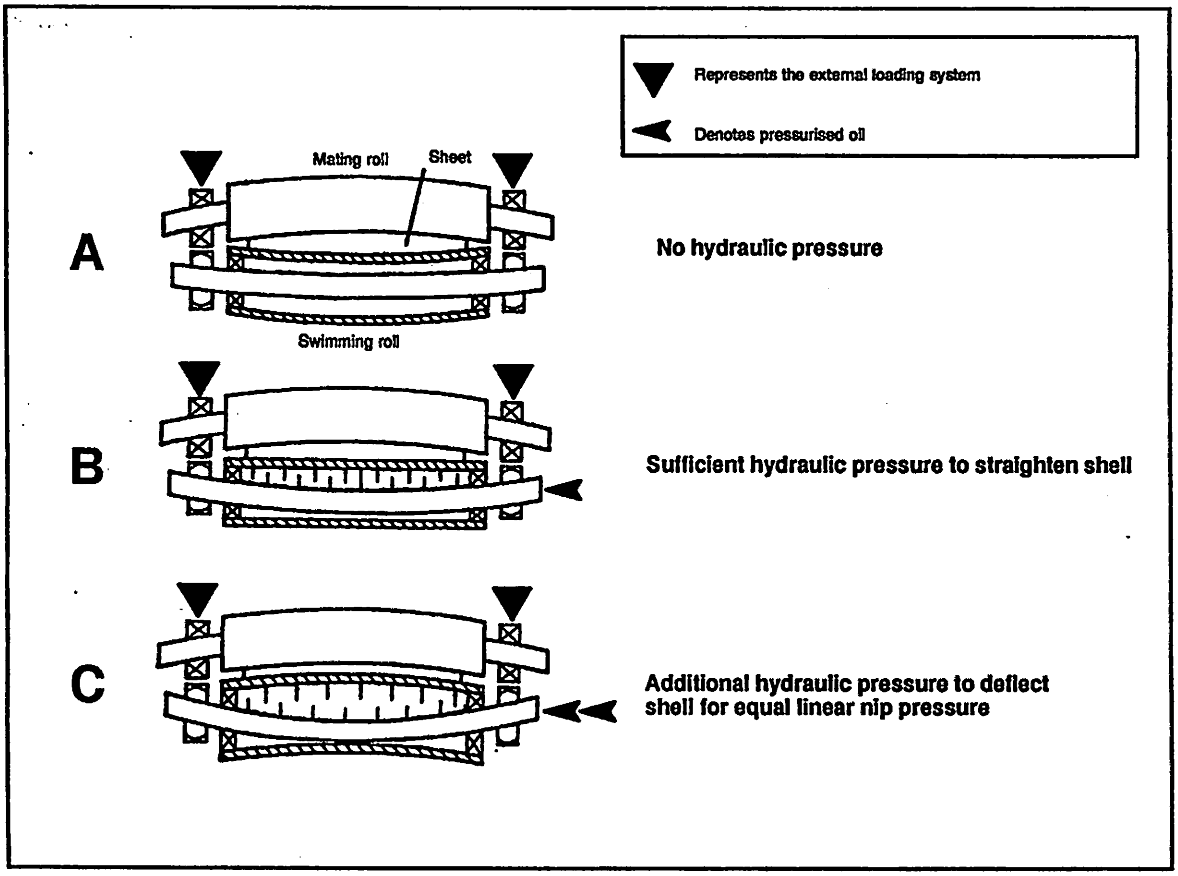


Fig 2

In example B, some hydraulic pressure is applied to the Swimming roll. The resulting reaction between the shaft and the shell causes the shell to straighten. As can be seen, the extent to which the shaft deflects is greater. Although the nip profile is improved over that in example A, it is still unequal because of the deflection of the mating roll.

In example C, additional pressure is applied and the shell deflects positively to match the curvature of the mating roll. Although the mating roll is still deflecting due to the end effects that it is experiencing, the nip pressure is now equal across the sheet.

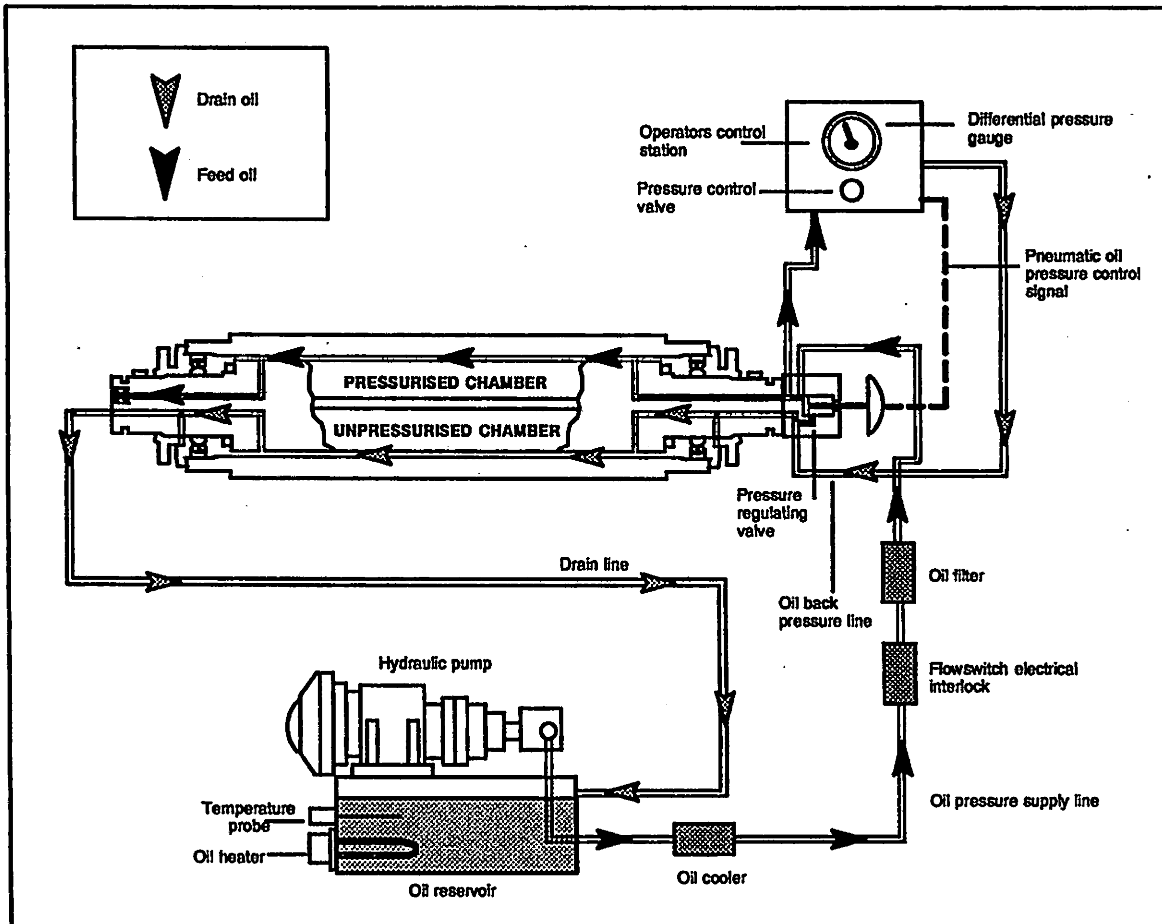
4. The control unit (Fig 3)

Note: control schemes can differ greatly according to customer requirement. The following considers a basic system which is sufficient to explain its fundamental responsibility.

Oil is drawn from the reservoir by the hydraulic pump and is pumped through the feed line towards the feed port of the Swimming roll. There are four components through which the feed line passes.

4.1. Oil cooler

The oil temperature is monitored by a temperature probe which is immersed in the system oil in the reservoir. If the oil temperature rises above the required operating level the water supply to the oil cooler will be switched in to reduce the temperature.



Most basic Swimming roll system configuration, comprising oil supply and pump, Swimming roll and oil pressure control scheme

Fig 3

4.2. Flowswitch electrical interlock

This is a fail–safe device which will activate an alarm or unload the Swimming roll (or both) if the flow of oil through the feed line is lost. This could be the result of a pump failure or a break or blockage in the line.

4.3. Oil filter

The oil filter removes any foreign matter which may be present in the system oil, thus protecting the internal components of the Swimming roll and the pump from damage.

4.4. Pressure regulator

This device is attached to the end of the Swimming roll centre shaft and controls the flow of oil to the inlet (feed) and outlet (drain) ports. The level of oil flow to the roll is controlled by an internal piston which opens and closes an aperture to the ports depending on the oil pressure, relative to a set point.

Excess oil, superfluous to the Swimming roll load is routed into the drain port and on into the non–pressurised chamber. The set point or reference is a pneumatic signal originating from the operators console. The ability to adjust the reference signal gives control over the oil pressure in the Swimming roll and thus the level of deflection.

End