ANTI - STALL VALVE GLV3
DESCRIPTION OF DESIGN AND FUNCTION

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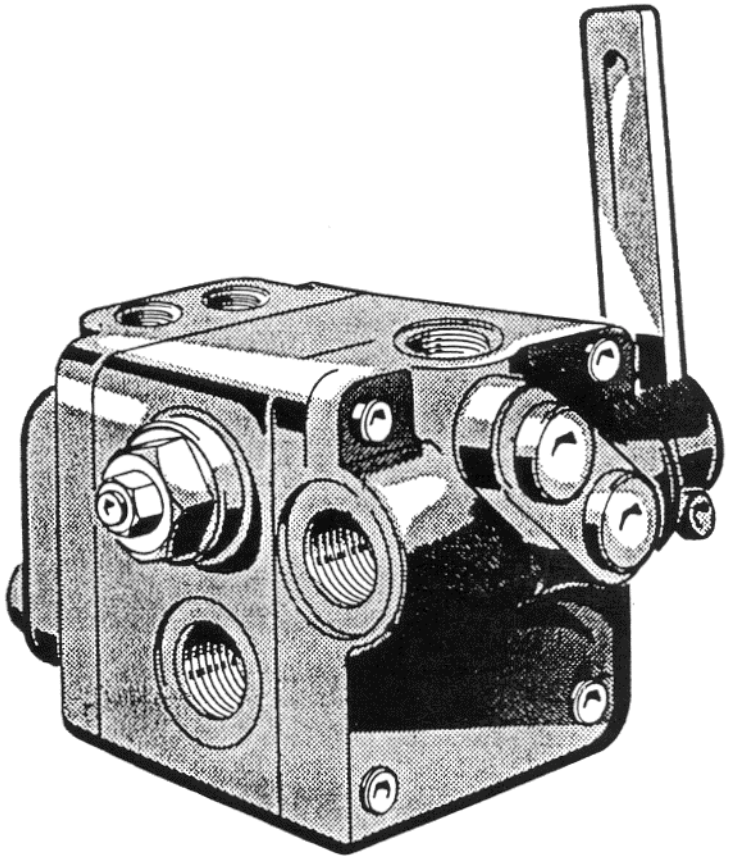

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1. BASIC OPERATION

Contrary to the "Power control" and the "power limitation", for which system pressure is used to keep the hydraulic power constant, the "ANTI-STALL VALVE" uses the speed drop of the drive engine as a control source when reaching the power limit.

2. ADVANTAGES

When supplying several working circuits with one drive engine, it is not necessary to reserve power limits for each individual circuit. When reaching the power limit of the drive engine only a part of the individual working circuits need to be under the influenced of "power limiting" control; the remaining circuits can pick up their full required power, giving priority to these circuits.

3. CONTROL SIGNAL

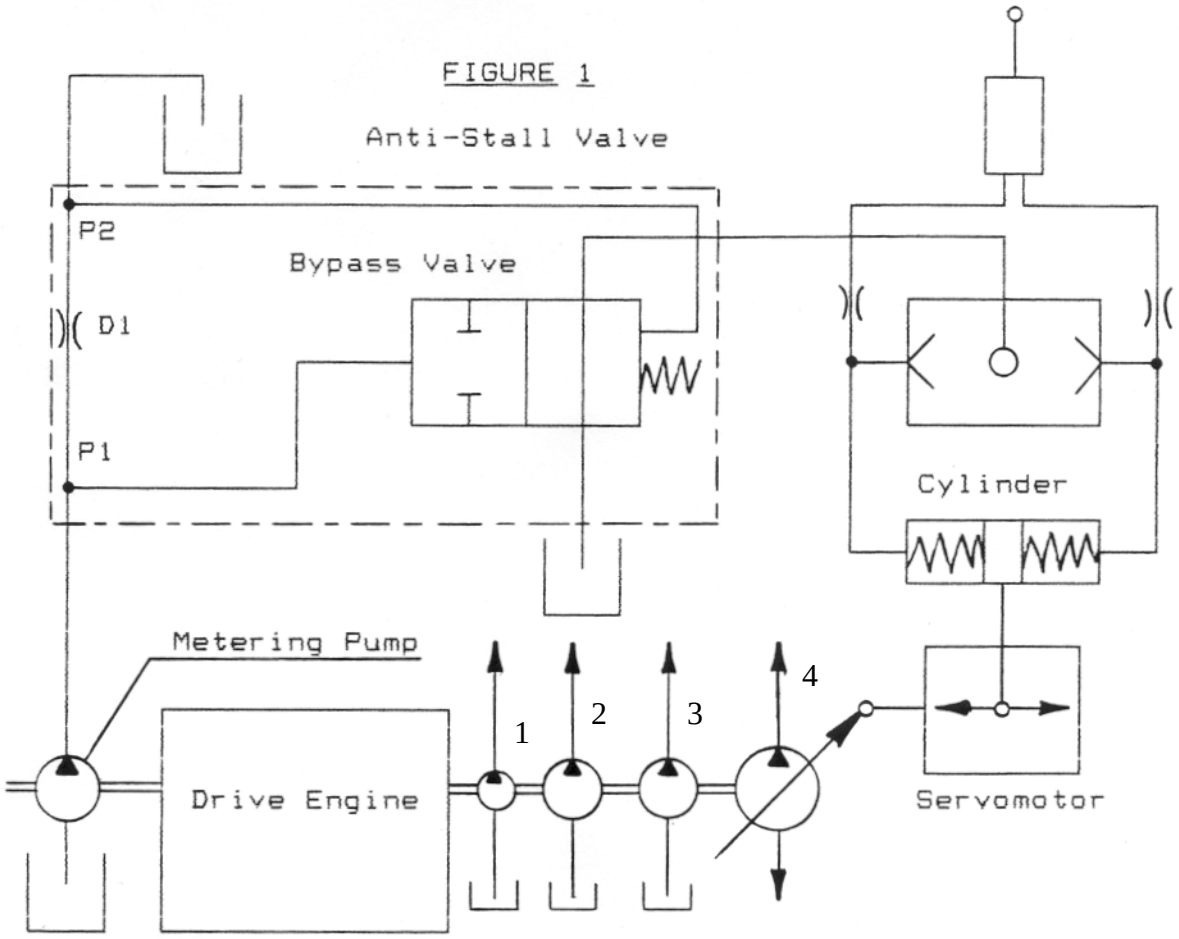
A control signal is generated by a metering pump coupled to the engine and its flow is proportional to the drive engine speed.

4. PERFORMANCE (FIGURE 1)

As an example, drive engine may drive four hydraulic pumps which would supply circuits 1- 4. Pumps 1-3 are fixed displacement pumps and pump 4 is a variable displacement pump with its flow adjusted by a servo motor via hydraulic remote control. The control pressure, which is pre-selected by the hydraulics remote control valve determines the flow of pump 4. This control pressure can be influenced by the bypass valve incorporated in the GLV3. If the bypass valve in the GLV3 is closed, control pressure from the control valve to the variable displacement pump will be uninterrupted. However if the bypass valve in the GLV3 is open, the pressure signal from the control valve to the variable displacemetn pump bleeds away and the pump reduces displacement.

In order to hold the bypass valve in the GLV3 closed, a $\Delta P = P1-P2$ of 30 psi is required across orifice D1. This pressure drop is produced by the restriction of the oil flow supplied by the metering pump. If the maximum power of the drive engine is exceeded by the exertion of all working circuits, then engine speed will drop, the flow of the metering pump will also drop, resulting in a reduced pressure drop over orifice D1.

When the pressure drop through D1 drops below 30 psi; the bypass vlave in the GLV3 opens and reduces the control pressure which is applied by the hydraulic remote control valve, and the flow of variable pump 4 is reduced resulting in a lower power requirement for circuit 4. As long as the engine speed is reduced by load, the bypass will continue. When the load demand on the engine subsides, engine speed will increase resulting in the reastablishment of the pressure drop through D1 of 30 psi. The bypass valve closes in the GLV3 and pump 4 strokes to a displacement dictated to it by control pressure from the hydraulic remote control valve.



5. IMPROVEMENT OF THE CONTROL ACCURACY

Orifice D1 posesses, like every orifice or throttle, a parabolic flow characteristic (Figure 2). A ΔP range of 0-30 psi corresponds with the flow area Δ Ql. Since the flow is proportional to the metering pump's input speed, for a ΔP of 0-30 psi a large speed drop of the drive engine would be required. However, if the ΔP = 30 psi into the area of 30 to 60 psi, then Δ Q2 becomes much smaller and also the speed drop of the drive engine . Raising the AP area to the 30 to 60 psi level is achieved by a series arrangement of orifice D1 with a pressure control valve D3 set at 30 psi (see Figure 3).

FIGURE 2

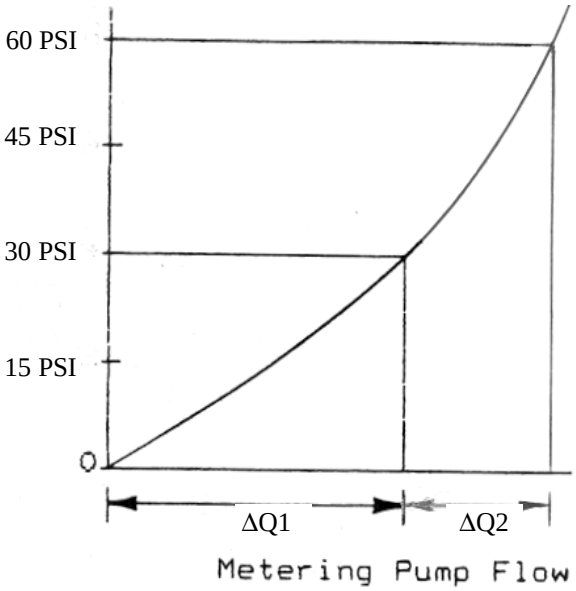
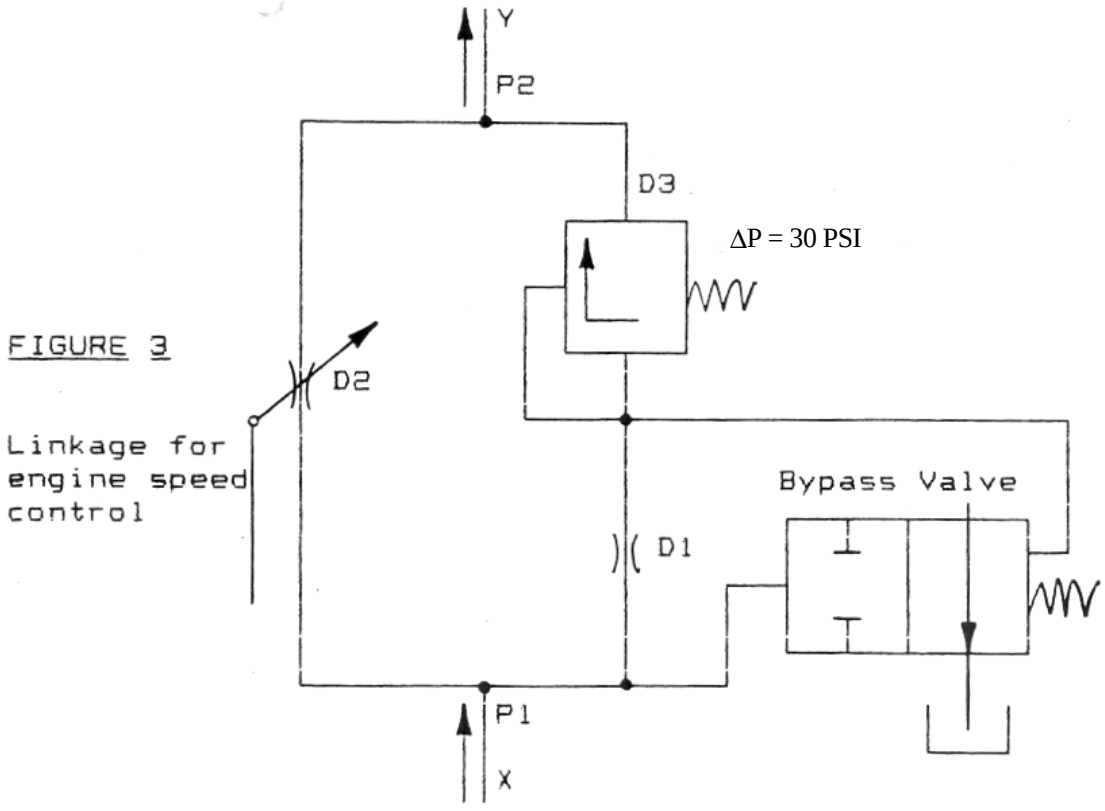


FIGURE 3



6. OPERATION AT REDUCED DRIVE ENGINE SPEEDS (PARTIAL LOADS)

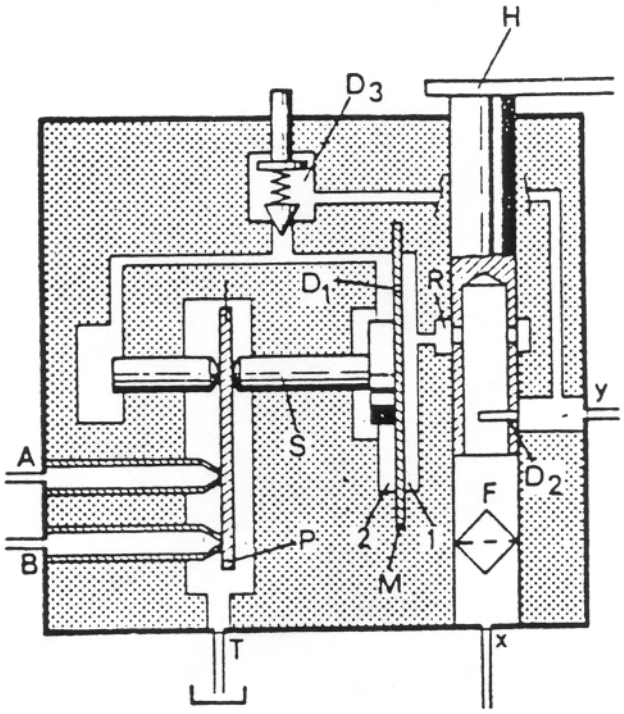
It is desireable for the GLV3 Anti-Stall Valve to protect the engine from overload at any engine speed. To accomplish this, an adjustable throttle orifice D2 is connected in parrallel to the fixed orifice D1 and relief valve D3 in series, see figure 3. If at orifice D1, a ΔP of 30 psi is required and pressure relief valve D3 has a fixed ΔP of 30 psi, throttle orifice D2 varies with engine speed so that there is a total ΔP of 60 psi between X & Y at all engine speeds. To do this, a linkage is attached to the D2's lever arm and the engine's injector pump lever.

7. DESIGN AND DESCRIPTION OF THE ANTI-STALL VALVE (FIGURE 4)

A part of the oil flow of the metering pump flows via port X to the adjustable throttle valve D2 and from there to port Y. Via linkage attached to the engine's the injector pump, throttle orificee D2 is adjusted by means of lever H proportional to the gas pedal setting, so there is a pressure drop of 60 psi between X and Y.

The other part of the metering pump flow goes through filter F and ring channel R to chamber I upstream of the membrane M. The flow of oil continues through orifice D1, in membrane M, to the pressure relief valve D3 set at ΔP = 30 psi to port Y. T he pressure difference of 30 psi at membrane M is sufficient to keep tension of the membrane which keeps the nozzles A and B (bypass valves) closed via pin S and reflecting plate P.

FIGURE 4



If the pressure drop at the membrane M is reduced to below ΔP = 30 psi, then the membrane deflects and plate P lifts off from the nozzles A and B. The control pressure at these nozzles reduces and the variable displacement pump(s) connected to the GLV3 reduce their displacement(s) thus reducing power consumption.

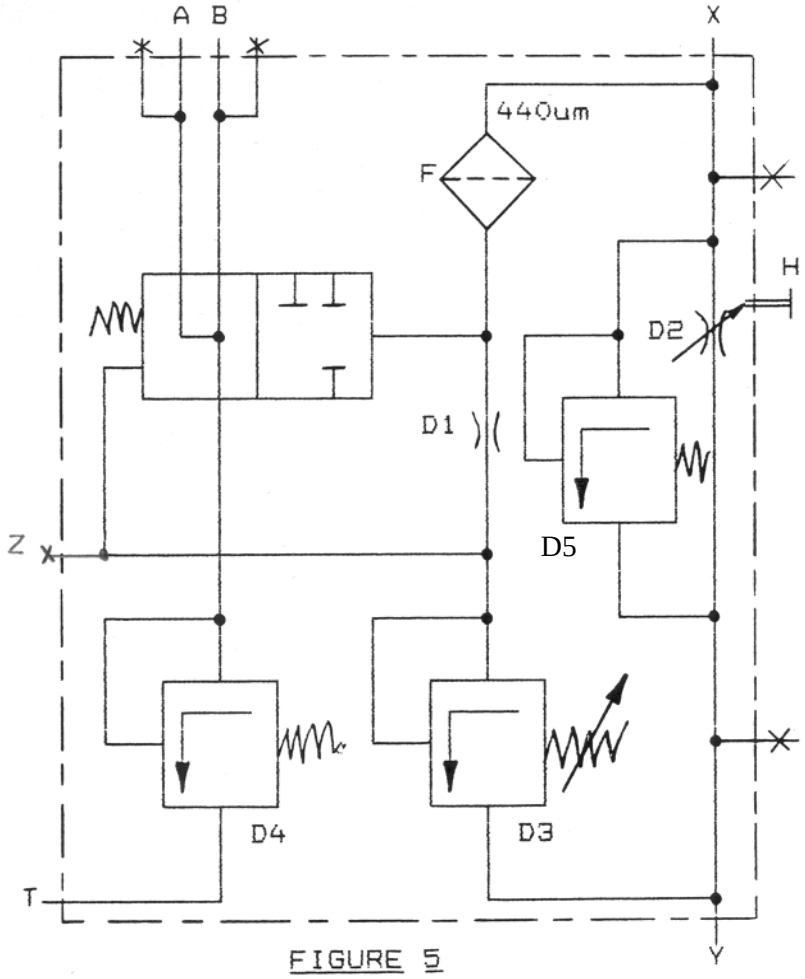


FIGURE 5

D2-adjustable throttle

H - adjustable lever

X -inlet

Y -outlet

F -filter

D1- 0rifice in membrane

D3-pressure control valve 30 psi

D4- tank connection pressure control valve 7 psi

Z - Guage Port

D5 - 145 psi Relief valve

Relief valve D5, set at 145 psi and arranged in parallel to the adjustable throttle valve D2, serves as protection of the membrane in case of erroneous operation of the adjustable throttle valve and at the same time for the protection of the control pressure source (upstream connection X).
An additional pressure control valve, D4 at port T, serves to maintain a minimal backpressure on control ports A & B when the Bypass Valve opens. D4 is only set to a low pressure of about 7 psi but a substantial improvement of the control is achieved and a minimum displacement of the pump is maintained without control oscillation.

8. TECHNICAL DETAILS

Figure 6 through 9 show the design and assembly of the GLV3 Anti-Stall valve.

FIGURE 6 - Section B-B

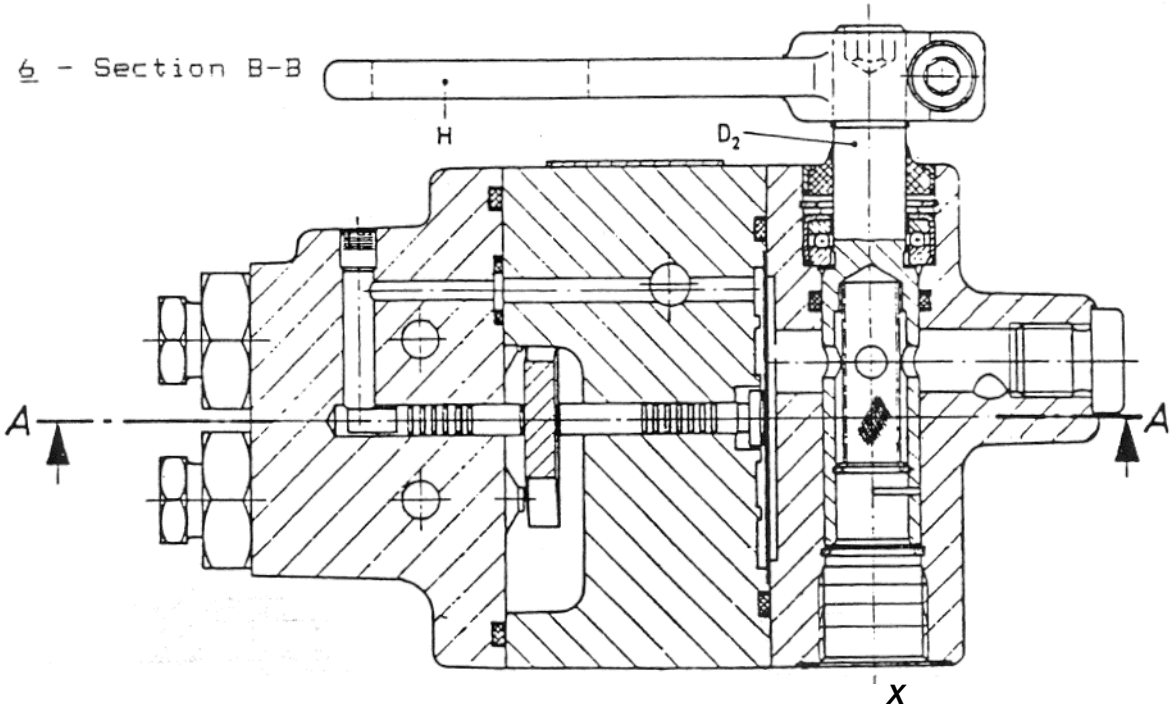


FIGURE 7 - Section A-A

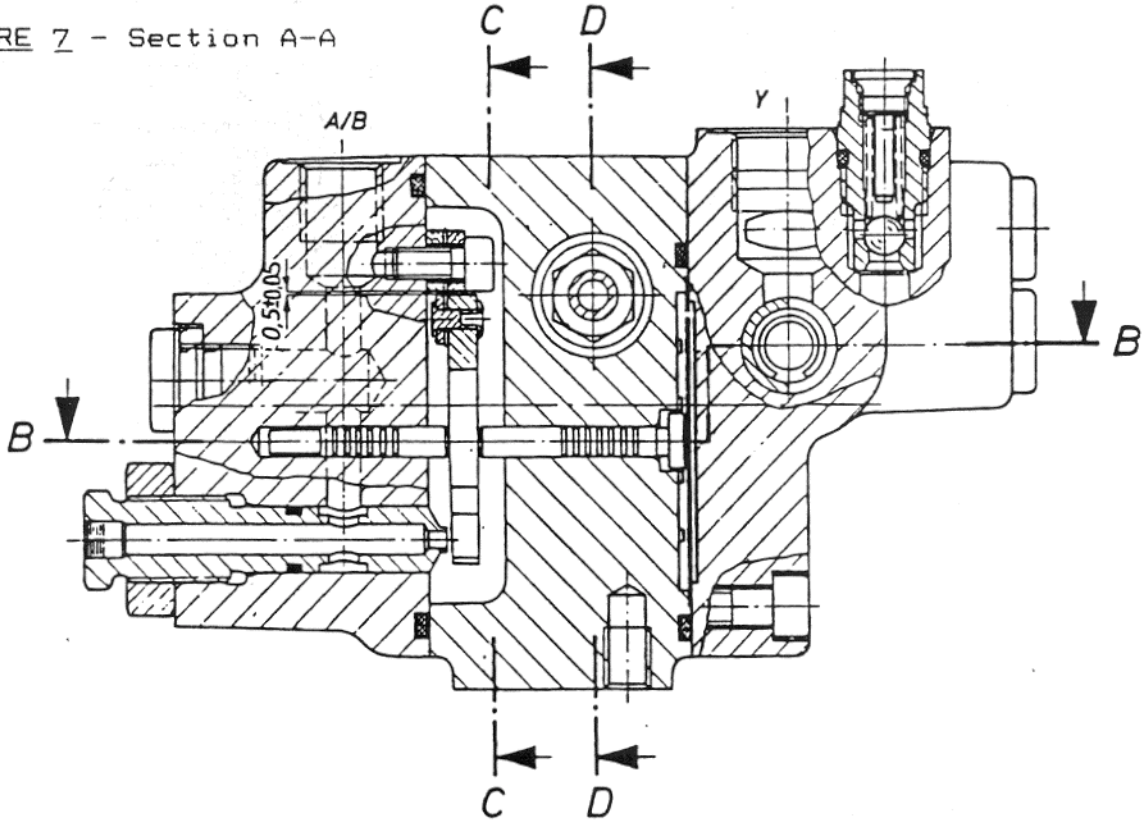


FIGURE 8 - Section C-C

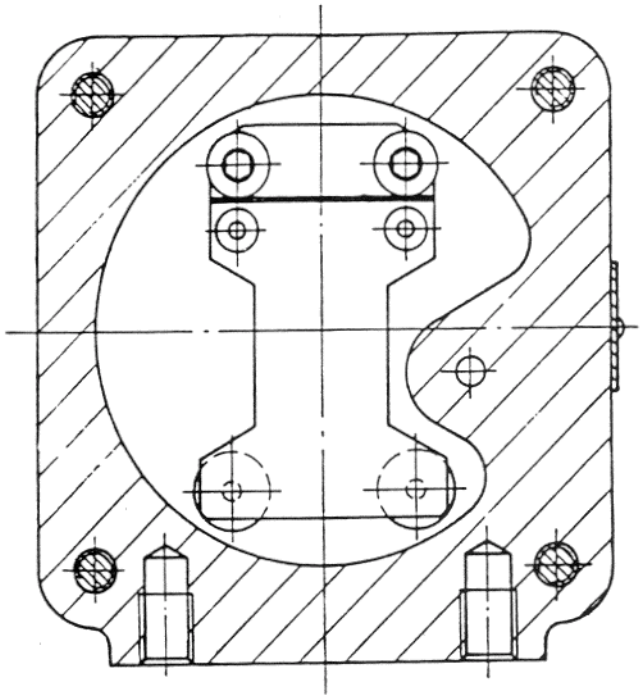
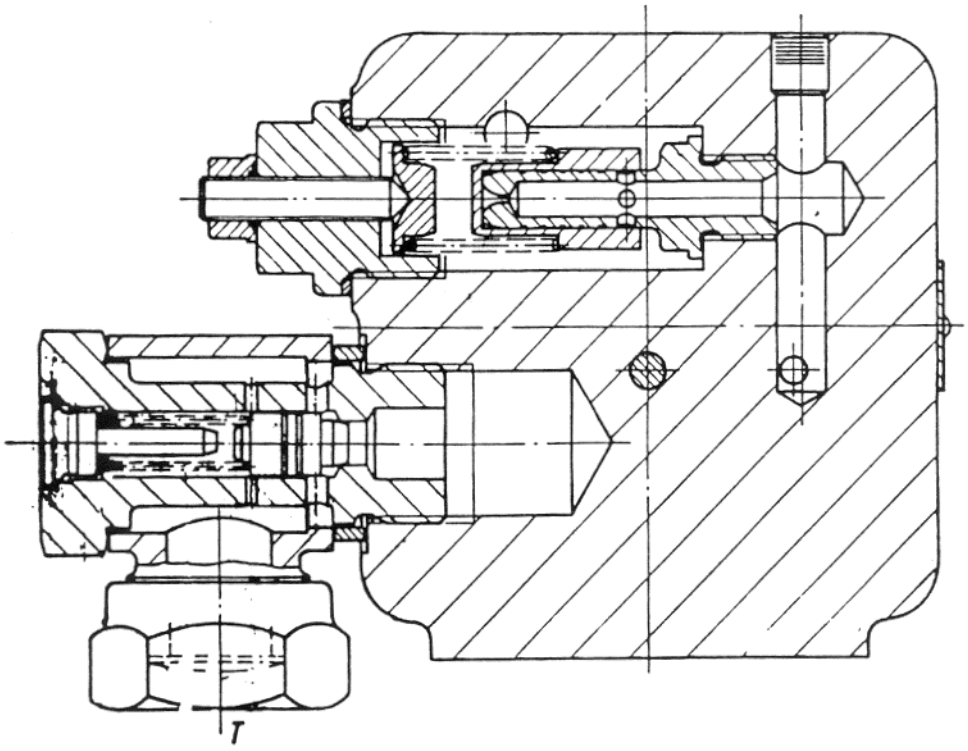


FIGURE 9 - Section D-D



Lever H and the adjustable throttle D2 are connected by a clamping device. For setting, the clamping device is to be loosened and the throttle D2 to be turned by means of an allen wrench.

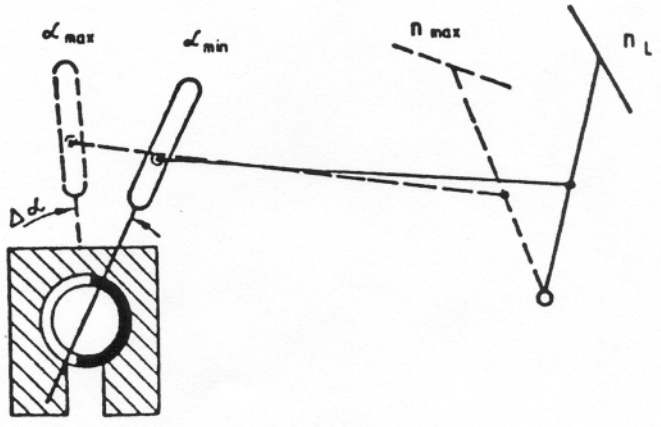
9. SETTING

Adjustment of the throttle D2 to the gas pedal position is possible by means of the clamping device mentioned under section 8 between lever H and adjustable throttle D2 and by a slot in the lever H (Figure 10).

Adjustment Sequence:

a) Make sure that the throttle valve D2 is not rotated by 180 degrees. In case of "more engine throttle", throttle valve D2 must open wider. Unloosen the clamping screw in lever H.
b) Set idle speed of the engine and turn the throttle valve D2 by means of an allen wrench in the end of the throttle stem until a ΔP of 60 psi occurs between measuring points X and Y. Lock the clamping screw in lever H.
c) Set maximum engine speed. The ΔP between X and Y must also be 60 psi. If not then move the linkage pivot point up or down in the slot of lever H until 60 psi is achieved. Lever angle α should not exceed 30 degrees between idle and maximum speed.
d) Check a number of times the ΔP at idle and maximum engine speed, and correct the adjustments until there is a ΔP of 60 psi through the whole speed range.
e) For best results, all linkage arms between pivot points should be parallel to each other.

FIGURE 10

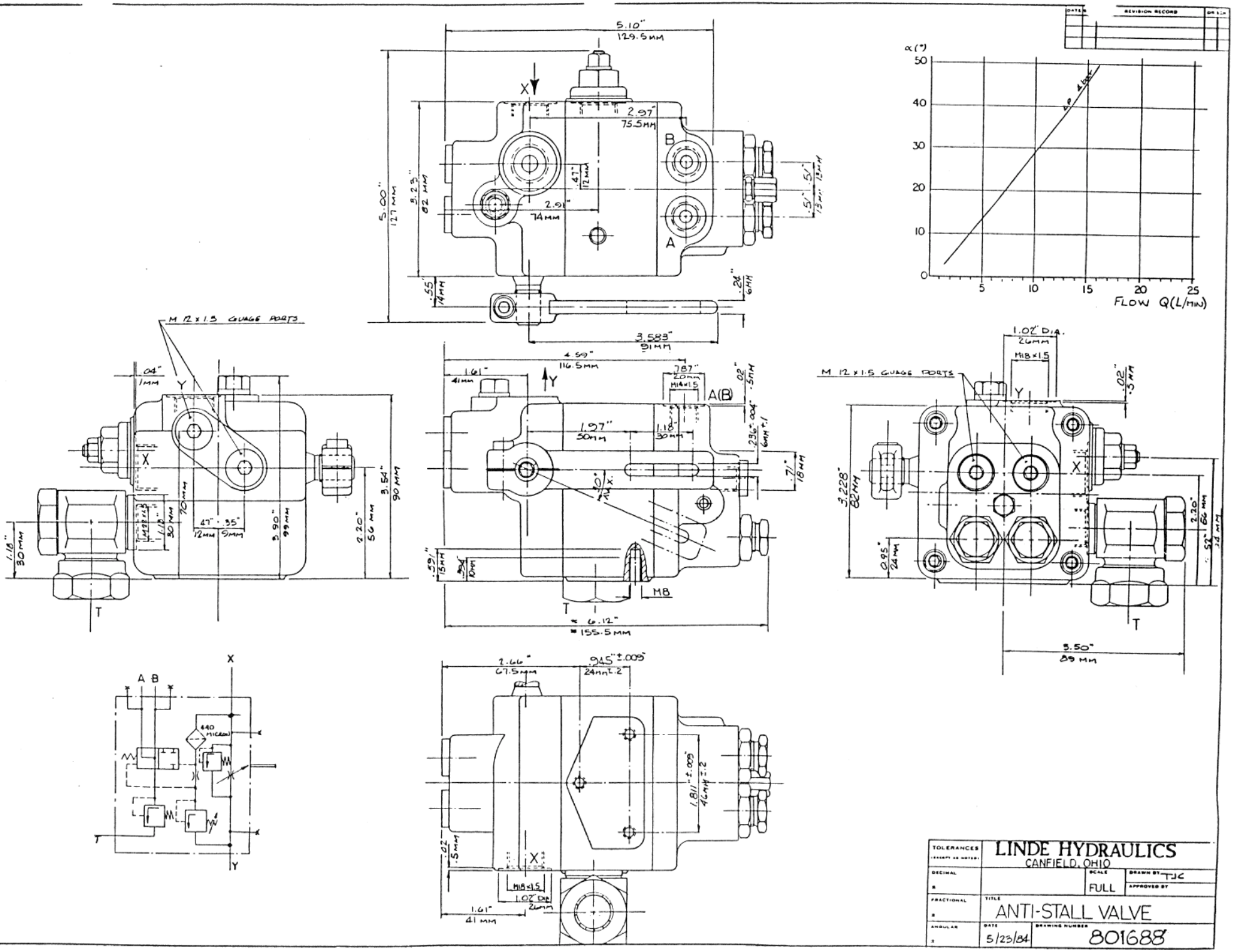


10. FURTHER USE OF THE METERING PUMP FLOW

The metering pump flow at outlet port Y can be used for subsequent actuating and control functions, since the pressure drop through the anti-stall valve is no more than 60 psi. However, the supply pressure to connection X must be limited to 580 psi by means of a pressure limiting. Therefore, after deduction of a pressure loss of 60 psi, up to 520 psi is available at port Y. (Example: Feeding of a servo system is possible if the required maximum servo pressure is under 520 psi).

11. INSTALLATION DIMENSIONS

See arrangement drawing 801688, page 11.



TOLERANCES (EXCEPT AS NOTED)	LINDE HYDRAULICS CANFIELD, OHIO		
DECIMAL ±		SCALE FULL	DRAWN BY TJC
FRACTIONAL ±	TITLE ANTI-STALL VALVE		APPROVED BY
ANGULAR ±	DATE 5/23/84	DRAWING NUMBER 801688	