IMPROVEMENTS ON THE SUSPENSION MECHANISM AT TRACTORS IN ORDER TO INCREASE LOCAL PRODUCTION FOR EU INTEGRATION

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ABSTRACT

Considering the fact that extension of using of hydraulic systems of action and adjustment represents a requirement of the actual stage of development and perfection of agriculture machines in the light of EU- integration, the paper presents some researches on the suspension mechanism which is acted by the hydraulic mechanism with automatic adjustment at tractors. There are presented some schemes of simple lifting and descending hydraulic systems at tractors and a concrete example of hydraulic installation of suspension mechanism used at a very popular tractor .

These scheme have the great advantages that they can be improved depending on the specific conditions where the tractor in aggregate with a machine work.

1. INTRODUCTION

The agricultural machines are coupled to tractor through the suspension mechanism with 3 points catch. The half borne machines are coupled to tractor with 2 points, also through the suspension mechanism, by the longitudinal tyrants of this.

The action of suspension mechanisms of tractors is made through some hydraulic systems, which have in their component the following elements: tank, pomp, distributor, valve, hydraulic cylinders, filters and hydraulic plugs. These systems are required the following demands :

- To assure in right time the lifting of carried machine from the work position to transport position
- To assure in right time the descending of borne machine from the transport position to work position
- To assure the maintaining of borne machine in every middle position, between the lowest position and the upper position (for transport);
- To assure the possibility of following the irregularities of ground by the borne machine, no matter what tractor is used
- To assure the maintaining of work parameters (work depth, height of cutting, etc.) in different work conditions during the machine exploitation

2. SYSTEMS CLASSIFICATION

Hydraulic systems used for acting the suspension mechanisms with 3 points catch can be: simple lifting and descending systems, adjustment systems and descending with automatic adjustment.

Simple lifting and descending systems fulfil the first 4 requirements exposed above.

Systems with automatic adjustment, beside operations of lifting , descending and maintaining machine in a certain position from tractor, also allow the maintaining of some parameters such as: work depth, traction force, at establised values, no matter what the way of variation of work conditions. [2]

Also, by using these systems, it can be transfered upon tractor vertical forces which action on machine, which leads to a overcharge of motor wheels , therefore to an increase of adherence force and traction force.

Depending on the adjusted parameter , the hydraulic systems with automatic adjustment of tractors can be classified in : force adjustment systems, position adjustment systems, pressure adjustment systems (for increasing adherence).

2.1. Functional principles of hydraulic systems for acting the suspension mechanisms

In fig. 1 [2], is presented the scheme of 2 simple lifting and descending systems at tractors, together with the suspension mechanisms. The actioning of suspension mechanism is made by the hydraulic cylinder with simple action (fig. 1. a) or with double action (fig. 1.b).

In neutral position (0, N) of distributor, the piston of hydraulic cylinder is blocked and machine is maintained in a certain position from tractor. In this position, the pomp P is not communicating with the tank,R.

In lifting position (1, R), the distributor makes the connection between the pomp P and hydraulic cylinder Ch. The oil pressure begin to increase and in the moment in which are overcame the resistant forces to the hydraulic cylinder piston, the machine begins to lift.

If the machine has a bigger weight than that which tractor can borne , the oil pressure rises until the limit for which is adjusted the opening valve, and the oil refuelled from the pomp is guided to the tank.

In the descending position (2, C) is accomplished the descending of machine. In the case of systems with simple action hydraulic cylinder (fig. 1.a), the distributer makes the connection between the cavity in front of piston and the tank. The oil from cylinder, under the weight of machines, is refuelled in the tank. Thus is accomplish the free descending of borne machine.

2.2. Types of hydraulic systems of suspension mechanisms of tractors

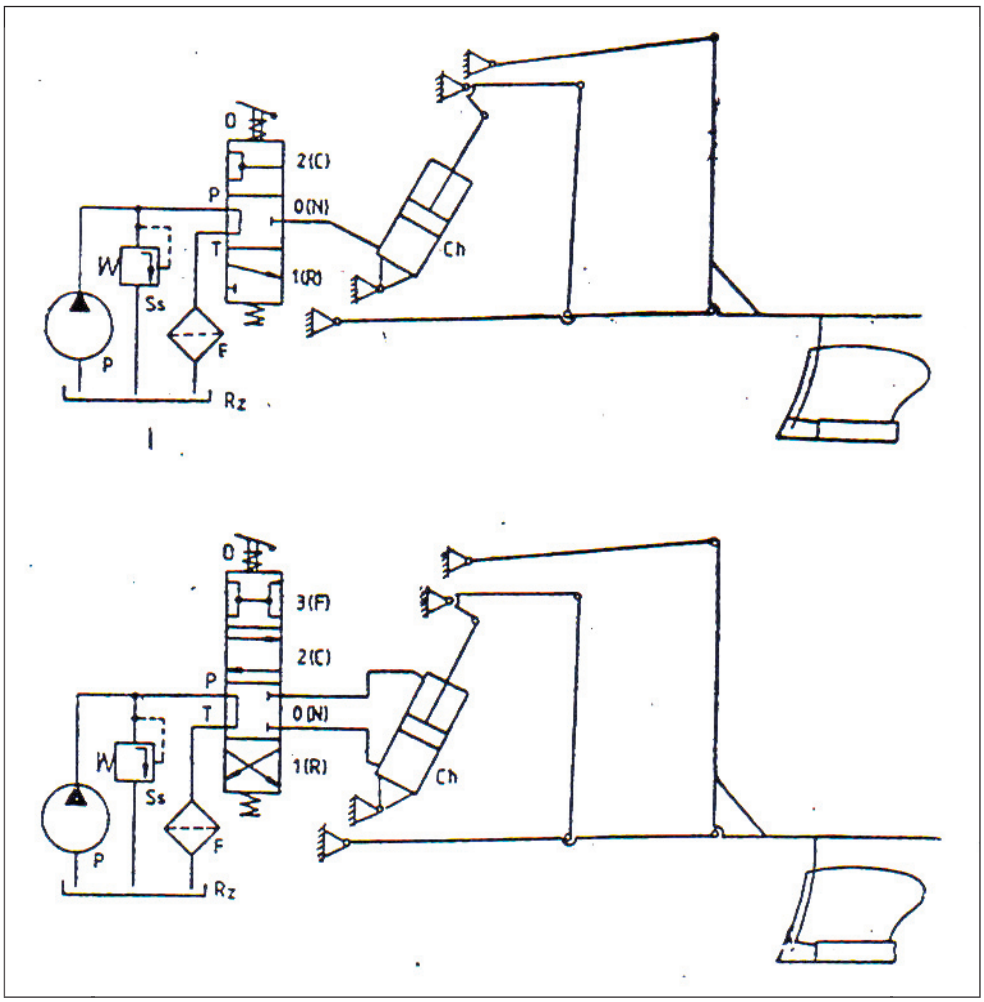
Such systems are used in our country at tractors such as: U-650 and U-651.On these tractors are mounted the hydraulic installations type IH-1 , presented in fig.2 [1].

This installation is formed from the following parts: pomp, oil filter , distributor, passing valve, safety valve, hydraulic plugs, pipes, hoses and hydraulic cylinders. The pomp is with toothed wheels, being mounted together with the pomp for the direction mechanism.

In neutral position (N fig.2 a and c) the distributor drawer is blocking the hole a of connection with the piston pomp of hydraulic cylinder Ch. Because back of the passing valve St is connected with the tank and in front of it there is pressure, the valve opens, allowing the oil to pass from the pomp to the tank. The oil from the front and back of hydraulic cylinder is blocked , so that the machine could be maintained in a certain position.

In the lifting position (R, fig.2 b), the distributor drawer connects between the pomp and the front chamber of hydraulic cylinder piston through the holes a and f, respectively between the back chamber of hydraulic cylinder piston and the tank (holes g and f).

Because the connection between the holes b and d is closed on both sides of passing valve piston , pressure would be the same, so



Up: System with cylinder with simple action; Down: System with cylinder with double action
P- pomp, F- filter, Rz- tank, Ch- hydraulic cylinder, D- distributor, Ss-safety valve
O (N)- neutral position; 1(R)- lifting position; 2 (C)- descending position, 3(F)-floating position

Fig.1. Schemes of simple lifting and descending hydraulic systems with the suspension mechanism at tractors [2]

the valve St remains closed.

The oil refuelled by the pomp enters the chamber from the front of hydraulic cylinder piston and it is accomplished the lifting of machine.

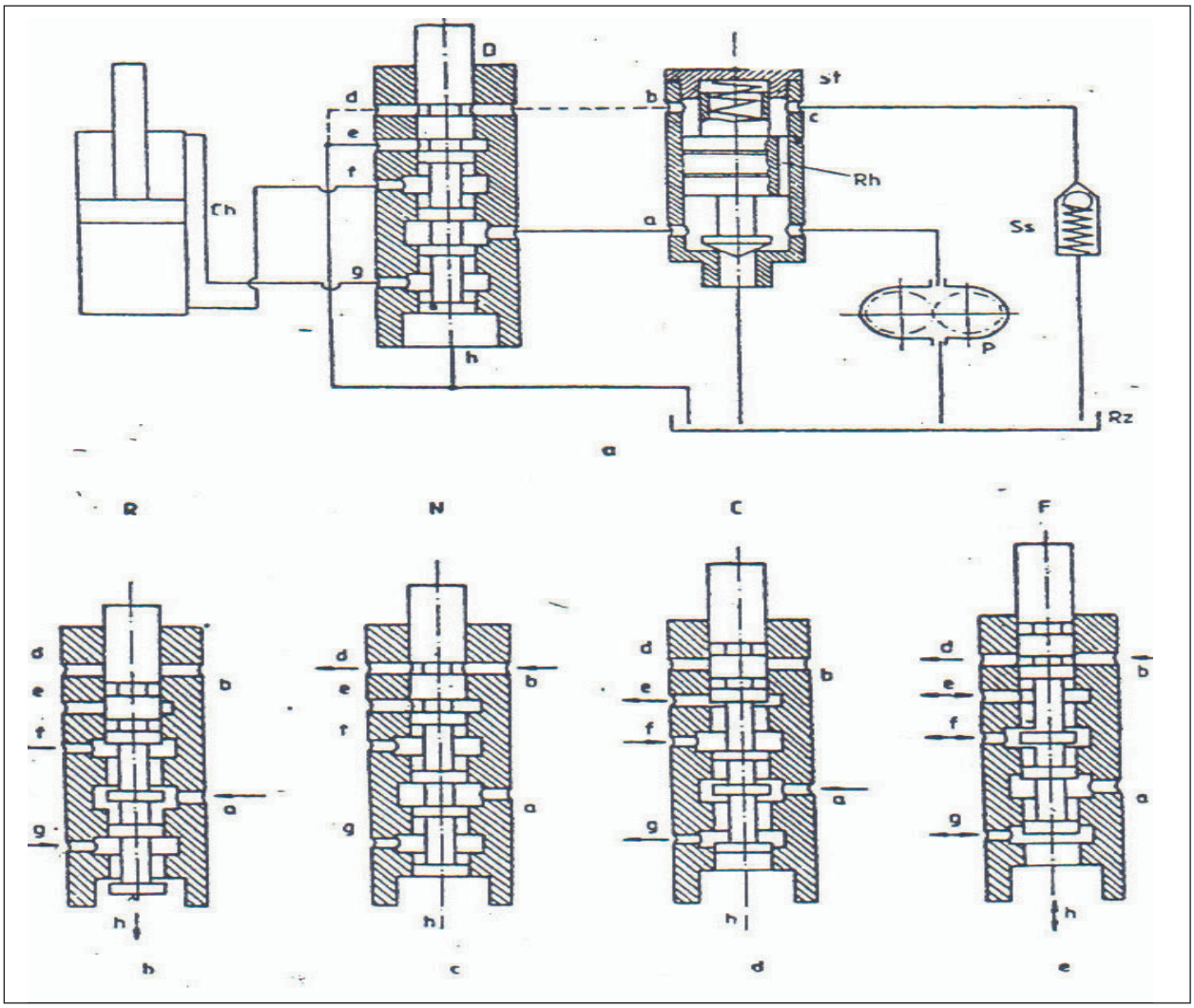
In the descending position (C , fig.2.d), the distributor drawer connects between the holes a and c and the holes f and e, the communication between the holes b and d being closed. As a result, the oil from the pomp is guided in the back of hydraulic cylinder piston and the oil from the front of it is refuelled in the tank, machine descending.

In the floating position (F, fig. 2 e), the distributor drawer connects between the holes b and d. as a result, the passing valve opens and the oil refuelled by the pomp is guided to the tank.

3. ACKNOLEDGMENTS

The improvements that can be made on the suspension mechanism leads to better performances of tractor and also of agricultural machines attached to tractors. These performances report to increase of productivity through the reducing the time of lifting and descending the machines attached to tractors.

A big aim of economic transition of countries from central and eastern Europe for the enlargement of European Union is sustainable economic growth. of farm sectors. In this specific domain, the using of modern tractors and agricultural machines with better



Ch- hydraulic cylinder, D- distributor, P- pomp , Rz- tank, St- passing valve, Ss- safety valve, Rh- hydraulic plug
a,b,c,d,e,f,g,h,- holes; N- neutral position, R- lifting position, C- descending position, F- floating position

Fig. 2. Functional scheme of hydraulic installation of suspension mechanism IH-1 mounted on tractor U-650 [1]
Fig. 2 a- installation scheme, Fig.2 b,c,d,e-positions (lifting, neutral, descending, floating)

performances will have a bigger and bigger importance.

REFERENCES

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[2] Dumitru, M, Agriculture mechanisation, Alma Mater Publishing House, Sibiu, 2005