

COMMISSIONER'S DECISION

Obviousness: Hydrostatic Drive For Tractor Vehicle

Hydrostatic transmissions were used in crawler type vehicles where the motion is primarily forward and reverse. The advantages of using it in a four wheel skid steer vehicle were not that apparent. Final Action-Reversed.

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This decision deals with a request for a review by the Commissioner of Patents of the Examiner's Final Actions dated May 13, 1977 on application 224,388 (Class 180-3) and Feb. 2, 1977 on application 224,390 (Class 180-3)

The applications were filed on April 11, 1975, in the name of Clark Equipment Company, and are entitled "Tractor Vehicle With Hydrostatic Drive Means". The Patent Appeal Board conducted a Hearing on September 27, 1979, at which Mr. D.McKenzie, Mr. J. Bauer, the inventor, and Mr. E. Ruf, the applicant's United States attorney, were present.

These applications are divisionals of application 126,196 which issued to patent number 979,371, dated Dec. 9, 1975. There were also two other divisional applications filed, namely 224,387 and 224,389, which have issued as patent numbers 985,179 and 985,641, respectively.

The applications before us relate to a compact four-wheel tractor-type front-end leader having pairs of driven wheels on opposite sides of the vehicle. a hydrostatic transmission arrangement drives the wheels on one side of the vehicle independently of the other side, and Figure 1 of the application indicates what is involved.

(See formula 1)

In the Final Actions, the examiner rejected the claims as containing no patentable subject matter in view of the following patents:

Canadian	747,216	Nov. 29,1966	Melroe et al
U.S.	2,941,609	June 21,1960	Bowers et al
U.S.	3,024,858	Mar. 13,1962	Davis et al
U.S.	3,161,245	Dec. 15,1964	Thoma
U.S.	3,416,623	Dec. 17,1968	Boone

The Melroe patent, which is owned by the applicant, is the vehicle used in these applications except that the transmission is a clutch-driven V-belt arrangement.

Thoma and Bowers each use a hydrostatic transmission for a track type vehicle.

Boone shows a hydrostatic transmission for an aircraft towing vehicle. Adams wheeled vehicle drive has a sprocket and chain arrangement in combination with the V-belt drive.

In the Final Action of application 224,388, the examiner stated (in part):

"The primary reference is the Melroe patent which shows a self propelled four wheel drive vehicle having independently driven wheels on opposite sides of the vehicle, the space transversely between the pairs of wheels being greater than the space longitudinally between each wheel, and a pair of compartments containing oil reservoirs.

The Bowers, Davis, Thomsa and Boone patents each show independent hydrostatic drive on opposite sides of a vehicle.

That such a well known hydrostatic drive could be used in a vehicle such as applicant's or the Melroe patent vehicle would be obvious. Merely because it has not been used in any one particular vehicle does not make such use invention. When there is an advance in the art, such as a new type of transmission, it is not patentable subject matter to merely use such transmission in different types of vehicles.

With respect to the sprocket and chain arrangement, this is shown in the Adams patent, and can be used with any type of transmission. The use of this particular arrangement is merely a matter of choice. The use of a chain tightener is also well known.

With respect to applicant's arguments that there is a synergistic effect produced in the present vehicle, the examiner cannot agree.

The increased maneuverability when cornering the vehicle is the result of a known characteristic of hydrostatic transmissions, i.e. the ratio of speeds at which the wheels on opposite sides of the vehicle turn being infinitely variable. The balance of power in which the power not required by the inside drive is transferred

to the outside drive is also a characteristic of the hydrostatic transmission whether used with a tracked vehicle or a wheeled vehicle. The even application of power is also a result of the infinitely variable speeds, which, as stated above, is a known characteristic of the hydrostatic transmission."

In response to the Final Action, the applicant stated (in part):

"The issue is very simple. Claims 1 and 2 recite a novel combination of a four wheeled skid steered front end loader type vehicle with independent variable hydrostatic drives on each side. While "hydrostatic" does have other meanings, it is used extensively in this industry (and in this application) to refer to this independent infinitely variable type of drive. The Examiner has rejected the recited combination as being obvious from a combination of the applicant's Canadian Patent 747,216 to Melroe et al, which shows a four wheeled vehicle with clutched drives, Canadian Patent 755,913 to Adams, Jr., which shows a sprocket and chain arrangement, and the other four United States references which show track type (or two wheeled) vehicles with independent hydrostatic drives.

The applicant is a leader in this industry and has a very complete knowledge of these types of vehicles. In fact, an affidavit by the inventor, Mr. J. Bauer, is attached, setting forth some of the advantages of the applicant's "BOBCAT" Loader over the prior art and the considerable commercial success thereof. While skid steered front end loader type vehicles have been in use for quite a number of years, they have experienced a widespread and dramatic increase in popularity since the applicant introduced this combination. This is because the combination has produced an unexpected synergistic improvement in performance. Although it was previously known to use independent hydrostatic drives on larger crawler type vehicles, these were not commercially successful because of operational difficulties, particularly the considerable degree of skill required to operate them and also their loss of power.

It will be apparent that it is desirable that relatively small vehicles of this type be able to operate quickly and often in confined areas. Therefore, it is important that the vehicle operate smoothly and continuously, much as a conventionally steered vehicle, and this has been impossible with prior art skid steered vehicles. Furthermore, it is important that a person be able to quickly learn how to operate the vehicle. The ratio of the speeds at which the wheels on opposite sides of the vehicle turn is infinitely variable, thereby enabling the vehicle to be turned through a smooth radius at any speed which provides this dramatically

increased manoeuverability. In the previous clutched vehicles this was a difficult "stepped" motion achieved by braking. In crawler type vehicles improved turning is accomplished by the special relationship of the track width to the width of the machine and other design factors. If the track design violates the design formula for steerability, the machine may be turned only with great difficulty and in the extreme may simply be propelled backward or forward. This problem becomes even more acute in four wheel drive vehicles because the load is distributed at four different points, two on either side of the vehicle, and the steering forces must be applied to the ground at these points.

The consideration before the Board is whether or not the applicant has made a patentable advance in the art.

We have considered with care the able and interesting arguments presented at the Hearing by Mr. McKenzie, Mr. Bauer and Mr. Ruf.

It is the examiner's position that it is obvious to replace the V-belt clutch driven transmission of Melroe with the hydrostatic transmission. He has cited several references to show that the hydrostatic transmission is well known.

On the other hand, the applicant argues that combining the hydrostatic transmission with the Melroe vehicle provides an "unexpected synergistic improvement in performance". Mr. Bauer outlined the importance of this type of vehicle being able to operate in confined areas with precise motion control. While the clutch driven V-belt drive of Melroe was successful, the addition of the hydrostatic transmission has improved its performance considerably.

One of the problems of the clutch-driven V-belt transmission is that of operator fatigue caused by the manual effort required to operate the steering levers. These levers require a force of 60 to 80 pounds, which would overstrain an operator after a few hours of work. Another shortcoming of the transmission used in Melroe was that life expectancy was short as the clutch expectancy is 300 hours operation, and the V-belt drive is approximately 1000 hours. A further drawback of the V-belt transmission was the fact that the largest available type could only transmit 30 horsepower, which was not enough for the expected 100 horsepower units that the company wanted to produce.

Mr. Bauer concerned the combination of the hydrostatic transmission with the Melroe vehicle in 1966, but there were no commercial hydrostatic transmissions available for their requirement in the price range that their company allotted for this component of the vehicle. At that time, hydrostatic transmissions were used in crawler tractors, as evidenced in

the cited art, as well as a very expensive type used by the aerospace industry which used it to generate electricity at constant speed from a variable source. At this point in time, there were also several other manufacturers producing this type of vehicle with the clutch - V-belt transmission.

After obtaining agreement from a manufacturer to produce a hydrostatic transmission suitable for their type of vehicle, the applicant found it provided numerous advantages over the Melroe transmissions. One of the inherent features of the hydrostatic transmission is that it has a life expectancy of 250,000 hours compared to the 1000 hours belt life of the prior art. Also the control levers require very little effort to maneuver the vehicle, so there is no problem with operator fatigue. It was found that when a comparison of identical vehicles of this type was made, the vehicle equipped with the hydrostatic unit could do 2 to 4 times the work of one equipped with the clutch and V-belt drive arrangement. Further, the "stepped" type of steering action was eliminated with the hydrostatic transmission, which reduces the wear and tear on the vehicle, with the resultant increase in life expectancy.

We believe that since this is a relatively small vehicle, its ability to operate quickly and often in confined areas is definitely improved with the use of the hydrostatic transmission. Granted this type of transmission was used in crawler type tractors, but their motion is primarily straight line movement in forward or reverse, and the advantages of using this transmission in four wheel drive skid steer vehicle of Melroe would not be that apparent.

Another factor that has been argued is commercial success. According to Mr. Bauer, in 1966, prior to the use of hydrostatic transmissions, the company sales were 7 million dollars, and the estimated industry worldwide sales were 15 million. Currently, all companies now are using the hydrostatic transmission. The sales for the Clark company are expected to be \$80 million, and the industry estimate is in the order of \$200 to \$250 million. The nature of the invention is not one where the consumer is susceptible to advertising pressures to obtain sales, and we have come to the conclusion that the major reason for the commercial success is the hydrostatic transmission.

In retrospect it may well seem that it would be obvious to place the known hydrostatic transmissions in small wheeled vehicles, and we can understand how the examiner came to that conclusion. However the submissions made at the Hearing, subsequent to the examiner's Final Action, have convinced us otherwise. Where the hydrostatic transmission was used previously in tracked vehicles, it created problems by virtue of the forces placed upon the tracks in turning, which frequently forced the tracks off their support. The width of the vehicle compared to its length is basic to the success of the in-

vention. Our thinking has also been influenced by the numerous advantages possessed by the machine claimed, and its quick commercial success once it was put on the market.

In view of the evidence before us, we therefore conclude that there is "ingenuity in the invention".

There was some objection raised by the applicant about the requirements for divisional filings under Canadian practice. We have reviewed the three patents already issued to the applicant, and find that each is directed to a separate invention, and therefore the requirement for division was proper.

We do find however that the two applications before us are directed basically to the combination of the hydrostatic transmission with the Melroe vehicle. It would appear that there is only one invention involved in these applications, and a claim complying with Rule 60 would be sufficient to meet the statutory requirements to permit both to be combined in one application.

In summary, we are satisfied that the applicant has made a patentable advance in the art and we recommend that the Final Action refusing the claims be withdrawn.

G. A. Asher  
Chairman  
Patent Appeal Board

S.D. Kot  
Member  
Patent Appeal Board

I have reviewed the prosecution of this application and agree with the recommendation of the Patent Appeal Board. Accordingly, I withdraw the Final Action and return the application to the examiner for resumption of prosecution.

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Agent for Applicant  
  
Toronto, Ont.

Dated at Hull, Quebec  
this 1st. day of December, 1978