

COMMISSIONER'S DECISION

UNOBVIOUS: Preferred Embodiment Clears Prior Art.

A pipe disclosed for transporting fluid with rotational flow produced by helical ribs on the inner surface of the pipe, the ribs having specified pitch and height dimensions and "sharp and pointed" innermost tips was shown by the citations including the purpose of "mixing" the fluid. The embodiment with the added feature of the helices extending in opposite directions in successive sections of the pipe not taught by the prior art is patentable.

FINAL ACTION: Affirmed in-part; some of the amended claims accepted..

This decision deals with a request for review by the Commissioner of Patents of the Examiner's Final Action dated February 26, 1973 on application 097,780. This application was filed on November 10, 1970 in the name of Hideo Takeda and refers to a "Method of and Apparatus for Transporting Fluid." The Patent Appeal Board conducted a Hearing on January 23, 1974, at which Mr. R.D. Mackenzie represented the applicant.

This application relates to an apparatus for transporting fluid comprising a pipe having helical protrusions on the internal surfaces thereof which cause fluid transported therethrough to rotate about the axis of the pipe. This prevents sedimentation of solids in the fluid. The protrusions are so shaped as to produce that result.

In the prosecution terminated by the Final Action the examiner refused the application on the ground that the subject matter is obvious in view of references cited, and as coming within the ordinary skill of workmen in the art.

In the Final Action the examiner stated in part:

This application stands rejected in that the subject matter set forth is that which could be expected from one having ordinary skill in the art to which the alleged invention pertains in view of the following applied references. The differences over the prior art would be obvious to a skilled workman.

References Re-Applied

Canadian Patent

101,500 October 16, 1906 Cl. 302-32 Dwgs. 1 sht. Milne

United States Patents

2,661,194 December 1, 1953 Cl. 259-151 Katovsich

2,095,242 October 12, 1937 Cl. 158-74 Dick

Each of the above references shows various means of a helical configuration on the inner surface of a material carrying conduit to effect a spiral flow of the contents within the conduit to facilitate flow therethrough.

Applicant's claims differ over the noted prior art by having a smooth transition area between the inner wall of the conduit and the body of the helical protrusion. Such a distinction is held to be a mere matter of choice and elementary design. It is obvious that in the interest of facilitating a helical flow of the material the areas which the material contacts should be smooth to thereby prevent or minimize fluid turbulence which is occasioned by a sharp corner or the like. Thus to eliminate any sharp areas in the prior art would be but expected skill. To give the protrusion a pointed edge is held to be a mere matter of choice and elementary design. Nothing of an unobvious nature results because of the pointed configuration. The crucial factor quite clearly the same between the instant device and the prior art is the helical flow occasioned by a helically configured insert. To arrange feeding equipment at spaced locations along a main line with connectors at each location to tie the auxiliary equipment to the main line is held obvious in view of the well known plumbing field which employs such a technique in tying a plurality of feeder lines into a main line. To arrange for the helical direction to be reversed between adjacent connected conduits is held to be a mere matter of choice, nothing of an unobvious nature resulting because of the choice and no new result being effected.

The applicant in his response dated May 3, 1973 to the Final Action stated in part:

As pointed out in the introduction to newly submitted claim 1, the pipe of this invention has at least four beneficial effects. Specifically, it minimizes precipitate on an internal surface of the pipe. As compared to a cylindrical pipe in experiment 1, there was a 10 to 1 reduction in precipitate. This is a particular problem at low Reynolds numbers, i.e. below 23,000 in the condition of laminar flow. Please note that most of the references have turbulent flow and higher Reynolds numbers. A second important effect is the minimizing of accumulation of gas bubbles in the upper portion of the pipe. This is also a particular problem with low Reynolds numbers in the laminar flow region. A third effect is accelerating mixing of the liquid or other fluid. A fourth and most important effect is promoting a piston flow condition.

These four beneficial effects are obtained with the specific construction illustrated and disclosed in the application, and recited in newly submitted claim 1. That is, not only must there be a cylindrical tubular pipe with a helical rib, but the pitch of the helix must be larger than half the internal diameter of the pipe, otherwise there is not the mixing and turbulent flow results. Moreover, the height of the helix must be between $1/6$ and $1/2$ the internal diameter of the pipe. If the helix is below $1/6$, the effect does not obtain the degree desired and if it is above $1/2$, the same occurs. Initially, the helical protrusion or rib has symmetrical streamline services to aid the laminar flow and more importantly to merge into sharp tips of the protrusions which reduce the volume of the protrusions in comparison to the total volume of the inside of the pipe. This results in a low pressure drop in the pipe as compared to an ordinary pipe with convention helices.

...

Lastly, it is submitted that the subject matter of the claims presently on file is not obvious from the reapplied references taken in combination. As discussed above and in the previous responses, none of the reapplied references disclose protrusions having a structure or shape as recited by the applicant, without which the desired operation cannot be obtained, as described in the disclosure.

The question to be decided is whether the subject matter of the present application can be considered as a patentable advance in the art.

A pipe for transporting fluid with rotational flow, minimizing precipitate on an internal surface of the pipe, minimizing accumulation of gas bubbles in the upper portion of the pipe, while accelerating mixing of the fluid and promoting a piston flow condition, the pipe comprising:

- a) a cylindrical tubular pipe having an inner surface and an outer surface,
- b) a rib-like protrusion extending inwardly from the inner surface of the pipe and positioned along a helix on the inner surface of the pipe,
- c) the pitch of the helix being greater than one-half the internal diameter of the pipe,
- d) the height of the rib-like protrusion being between one-sixth and one-half the internal diameter of the pipe,
- e) the protrusion having streamlined symmetrical side surfaces merging into the internal surface of the pipe, and
- f) the innermost tip of the protrusion being sharp and pointed in section.

The primary reference, Katovsich, relates to mixers for use in a jetting apparatus, and more particularly to a mixer for materials such as concrete, which are discharged at high pressure and velocity as a jet. The primary objective of this invention is to assure the uniform and accurate mixing of liquid and dry constituents of a material to be discharged as a jet under pressure. For a more complete description we turn to the disclosure, page 2 starting at line 31, which reads:

My improved mixer is best illustrated in Figs. 2 and 3 and comprises a metal sleeve or tube 32 which is split longitudinally along the parting plane 34 and whose parts or sections include radially outwardly projecting longitudinal flanges 36. The flanges 36 are apertured to receive securing members 38 for fixedly securing the sleeve parts together in register in a manner to withstand the application of high pressure and to withstand impact. The flanges 36 preferably terminate spaced from the ends of the sleeve sections, and the terminal portions of the sleeves are preferably provided with external screw threads 40 outwardly of the ends of the flanges 36.

Also, claim 1 of the reference reads:

A mixer for mixing solids and a liquid and adapted to be interposed in a conduit, comprising a rigid tubular housing having a smooth inner surface and means at each end for attachment to a conduit, and a tubular liner formed of resilient material and having a plurality of spaced integral inwardly projecting helical ribs of substantial height extending for substantially the full length of said liner, the inner edges of said ribs outlining a central passage through said liner.

The Milne reference discloses a tubular conveyor for "Peat Collecting Machines" with means to prevent the lodging of peat in the lower internal periphery of the tube. This means consists of one or more convolute or spiral wings secured to the interior of the tube.

The Dick reference discloses a tubular conveyor pipe for use in a fuel burner with means to aid in the mixing of the fuel. This means consists of convolute or spiral projections secured to the interior of the conveyor pipe.

One difference between the prior art and amended claim 1 which the applicant claims is significant is the pitch relationship to the diameter of the pipe, which is claimed as "being greater than one-half" of the internal diameter of the pipe. Another, is the height of the protrusions which are one-sixth to one-half the pipe diameter. Also considered of significance is the symmetrical streamlined surfaces of the protrusions which merge into pointed edges.

The applicant argues that the pitch of the helix of Katovsich is "less than one-half of the internal diameter" of the pipe. However, figure 3 in the Katovsich reference clearly shows that if we follow the spiral configuration of each protrusion we find that the pitch is within the limits set forth by the applicant, keeping in mind that "greater than one-half" is a broad limit, and that the drawings are illustrative only. Also the height of the ribs in the present device "is desired to be larger than one-sixth and smaller than one-half of the diameter of the pipe". It is noted that this is a desired limit only. On the other hand the Katovsich ribs are "approximately one-fourth inch" in a bore diameter of approximately one and three quarter inches.

With respect to "the streamlined surfaces which merge into pointed edges" the disclosure, amended page 2 beginning at line 14, reads: "...and the protrusions are preferred to have symmetrical inwardly concave streamlines on both sides in its vertical cross section with a pointed edge on the internal surface of the pipe." It is admitted that the primary reference, Katovsich, does not show the pointed edges, nor does it have the same angle of merger with the side walls as that disclosed in the present application. However, as previously noted from the disclosure "the protrusions are preferred to have...a pointed edge..."

The applicant argues that his invention minimizes precipitate on the internal surface of the pipe. However, Katovsich and Milne teach the use of a structure to mix thoroughly the matter therein. Dick also uses his helical structure to vaporize thoroughly the mixture therein.

The applicant argues that "the mixing effect is accelerated since the whole fluid rotates about the axis of the pipe." This however, according to the disclosure, was only in comparison to a standard cylindrical pipe. The references, especially Katovsich, teach that the mixing effect is accelerated by the helical protrusions on the internal surface of the pipe.

The applicant also argues that "there is little longitudinal dispersion of fluid in the order in which each portion has been sent therein, that is, the fluid flows through the pipe under a so-called piston flow condition." Once again in our view this is a natural occurrence under the conditions set out in the prior art.

The disclosure on page 4 describes an experiment, for example, where the helices are directed in the same direction in a pipe (i.e. claim 1). On this point line 33 reads: "The measured precipitate was about 10 gr. in the (standard) cylindrical pipe and about 1 gr. in the helical pipe." Therefore, there is a very noticeable lack of precipitate when the helical pipe is used as compared to the standard pipe. This improvement, however, is the natural result expected from the teachings of the cited prior art, which disclose the use of helical type pipes.

Claim 1 therefore, in our view, does not cover a patentable advance in the art. Claims 2, 3 and 4, which are dependent on claim 1 merely add limitations of no significance, such as the number of ribs and the relationship of the helices to the inside of the pipe. Accordingly, our comments about claim 1 apply equally to claims 2, 3 and 4.

The combination covered by claim 5, however, (considering that it depends on claims 2 and 1) is not taught nor suggested by the prior art. Claim 5 reads:

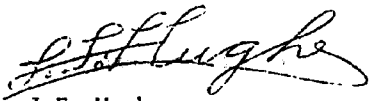
A pipe as defined in claim 2 wherein the helices extend in opposite directions in different sections of the pipe.

The disclosure on page 6 describes, for example, an experiment where the helices extend in the opposite direction in different sections of the pipe (i.e. claim 5) and reads: "On the other hand, in the case of the helical pipe in accordance with the invention, the turbid liquid was seen only near the adding nozzle (from 5 to 6 cm. from the nozzle) and further downstream from the solution was completely mixed and became transparent." Thus, it is seen that the solution was completely mixed when the apparatus was arranged with the helices in opposite direction in different sections of the pipe. This discloses a practical advance in the art. Furthermore there is no indication that the extension of the helices in opposite directions in different sections of the pipe would be an obvious alteration to make. Claim 5 therefore, in our view is acceptable. If any amendments are contemplated, however, the applicant might consider Canadian patents 811,022 and 772,959, and United States Patent 3,117,821.

Claim 6, which is dependent on claim 1, adds means for introducing fluid into a pipe. In the absence of patentable subject matter in claim 1, claim 6 in such circumstances also lacks patentable subject matter. It is suggested, however, that claims 3, 4 and 6 if re-numbered, could be made dependent on claim 5 when it is rewritten as new claim 1.

The Board is satisfied that claims 1, 2, 3, 4 and 6 do not disclose a patentable advance in the art. Claim 5 in our view, however, discloses a patentable advance in the art.

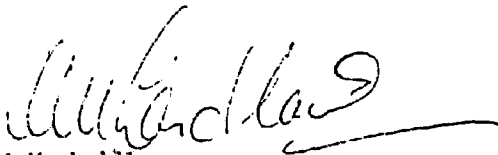
The Board therefore recommends that amended claims 1, 2, 3, 4 and 6 be refused, but that claim 5, if presented in independent form as claim 1, should be considered for allowance. Other claims mentioned above, if made dependent on an amended claim 1, would also be acceptable.



J.F. Hughes,
Assistant Chairman,
Patent Appeal Board.

I concur with the findings of the Patent Appeal Board. Accordingly, I refuse to grant a patent on the subject matter of amended claims 1, 2, 3, 4 and 6, but will accept claim 5 when presented in independent form, and other suitably dependent claims. The applicant has six months within which to delete claims 1, 2, 3, 4 and 6 and present an appropriate amendment, or to appeal this decision under the provisions of Section 44 of the Patent Act.

Decision accordingly,



A.M. Laidlaw,
Commissioner of Patents.

Signed and dated in
Hull, Quebec this
18th day of February, 1974.

Agent for Applicant

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