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GB 0805956 A

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(54) Fluid conveying device

(57) A conveying device for conveying materials by means of a fluid, the device including a flow passage and a nozzle fitting 13 located in the passage through which fluid is introduced into the passageway, the fitting including a series of passageways 33 communicating with a source of fluid 26, the passageways converging inwardly and being inclined to the longitudinal axis of the passage to impart a spiral flow into the fluid passing along the flow passage.

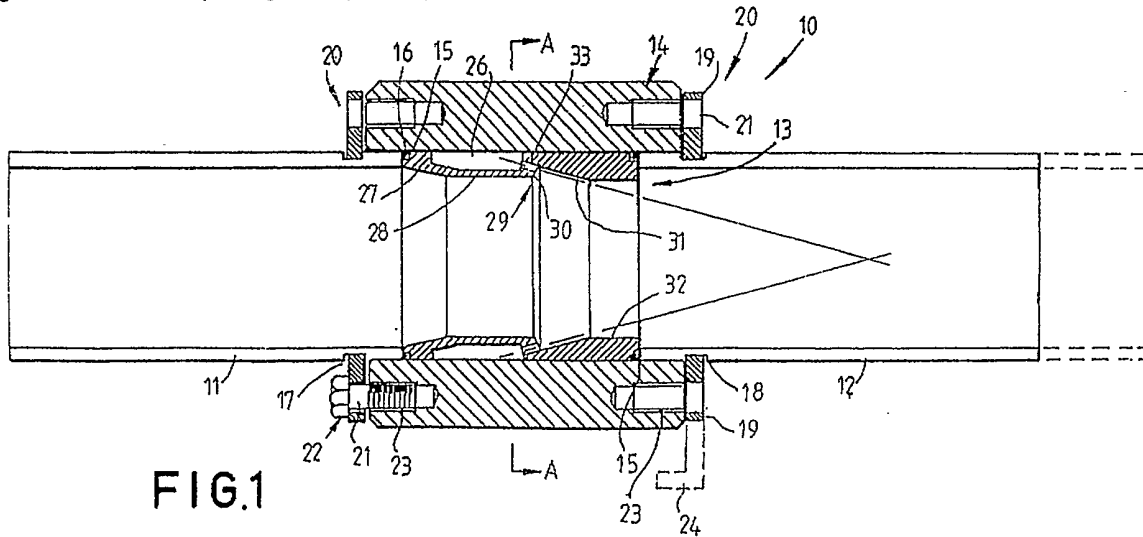


FIG.1

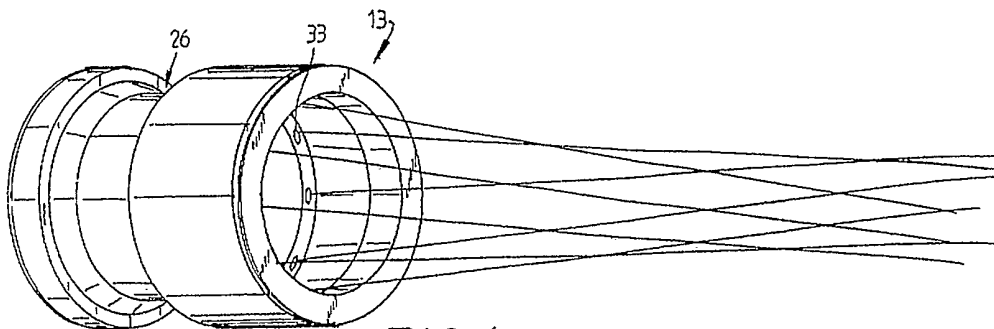


FIG.4

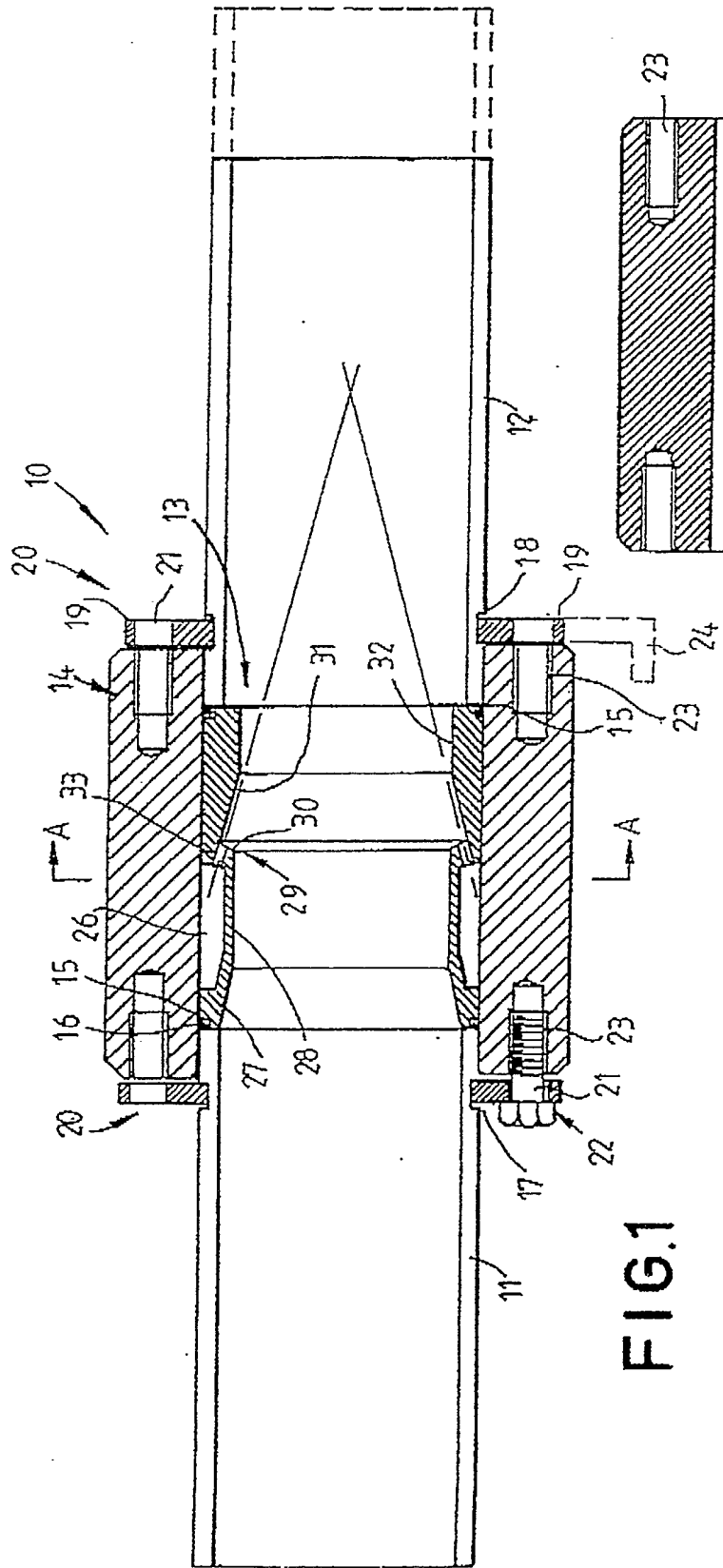


FIG. 1

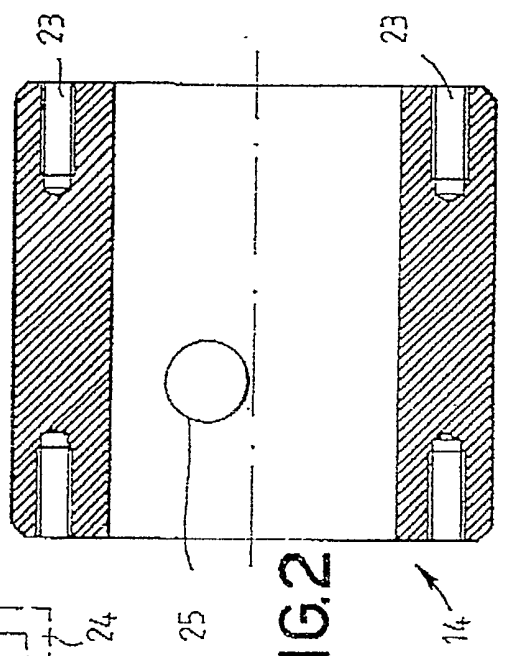


FIG. 2

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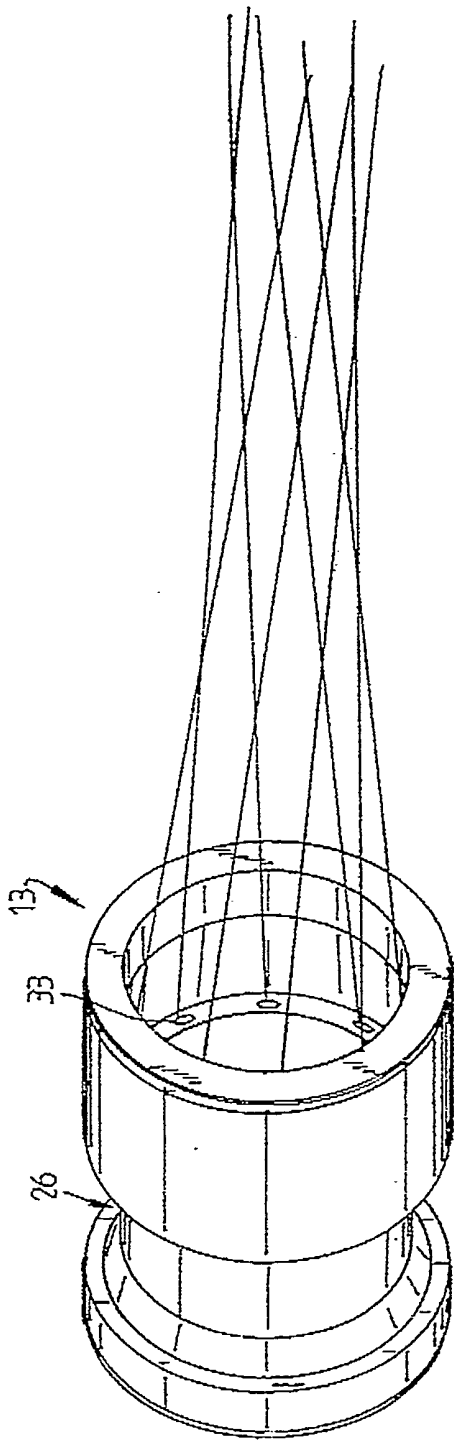


FIG. 4

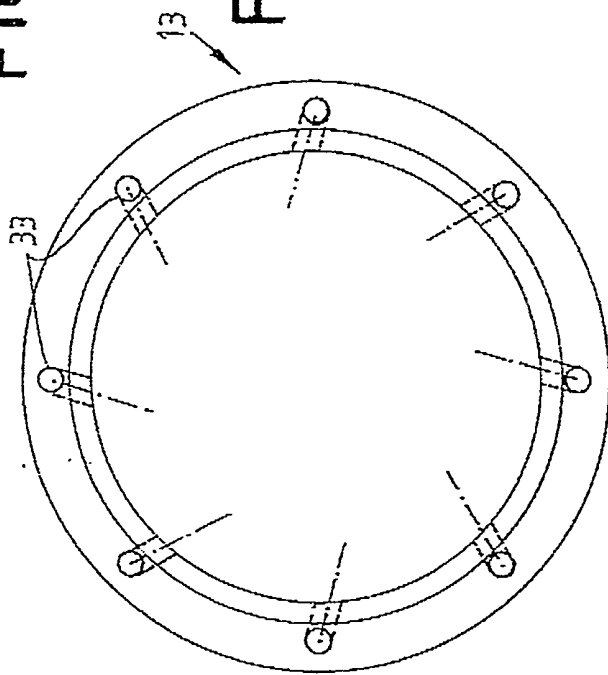


FIG. 3

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CONVEYING DEVICE

THIS INVENTION relates to an improved conveying device using a fluid as a medium for inducing movement in a product of liquid, gaseous, or solid form to be conveyed.

Pneumatic devices of the type using the principle of vacuum for conveying particular materials such as granular materials or for the supply or removal of gas or air from, or to a particular location are known. Such devices commonly include a bore in which is located a nozzle fitting which communicates with an external air supply and which includes a plurality of narrow passages through which air may pass from the air supply so as to cause a pressure reduction in the bore in a region upstream of the fitting. This pressure reduction creates a flow of air along the bore, this flow being subsequently employed for conveying purposes by for example exerting a suction force on the material to be conveyed. Alternatively, the device may be used as an air blast device.

The present devices which are available for the above purpose are not particularly efficient, either not creating a high enough vacuum or using excessive quantities of air to create a vacuum which is high enough to achieve the requirements of the device. The present devices available also do not allow ready access to the air passages so that in the event that blockages occur, considerable time is lost in disassembling the device and cleaning the blockages.

The present invention aims to provide a device of the above type which functions efficiently to create a high vacuum without the consumption of excessive air. The present invention also aims to provide in a preferred aspect a device in which ready access to the air passages is available for the purposes of cleaning.

The present invention further aims to provide a device in which the medium for creating the conveying flow may be a fluid other than air such as a liquid. Other objects and advantages of the invention will become apparent hereunder.

The present invention thus provides a conveying device including an elongated bore, a generally annular fitting arranged coaxially with, or within said bore, a fluid chamber

adapted to be connected to a source of pressurized fluid, a series of passageways in said fitting communicating with said chamber and said bore for directing fluid from said chamber in one direction along said bore, said passages having axes 5 converging inwardly longitudinally of said bore and said axes being further inclined transversely relative to the longitudinal axis of said bore so that fluid passing through said passages converges in its flow direction to a minimum at a throat region along said bore. The jets of fluid or gas 10 issuing from the passages thus converge inwardly towards each other to a minimum cross-section defining a throat, the jets of fluid thereafter diverging outwardly relative to the longitudinal axis of the body.

The inclination of the passages in two directions 15 creates in the fluid a spiral motion of fluid along the bore so as to ensure efficient conveyance of material, gas or liquid along said bore.

The fluid receiving chamber is preferably of annular form and communicates with a fluid inlet port extending 20 outwardly of the device. Preferably the axis of the inlet port is offset relative to the longitudinal axis of the bore but preferably not to an extent that the passageway is tangential to the chamber. Offsetting of the inlet port creates in the chamber an annular flow of fluid which continues into the 25 passage and assists in the creation of the spiral flow of fluid along the bore. The annular fluid chamber is preferably formed in an external wall of the fitting.

The bore is preferably defined by a pair of hollow suitably tubular members arranged coaxially with said fitting 30 and at opposite ends thereof. Preferably the fitting is located within a cylindrical housing having clamping means suitably in the form of a pair of end plates which clamp the tubular members to the housing in alignment with the fitting. In one form the tubular members are provided with annular 35 abutments preferably grooves adjacent their inner ends and the clamp end plates comprise half annular members adapted for location within the grooves and adapted to be secured to

opposite ends of the housing by screw fasteners or the like. One of the end plates may include a mounting bracket or alternatively a separate mounting bracket may be provided so as to enable mounting of the fluid conveyor in a desired
5 position. For varying the operating characteristics of the device say from a suction device to a fluid pressure device, the device may be simply reversed relative to its mounting plate.

The axes of the passages are preferably inclined
10 inwardly towards the longitudinal axis of said bore at an angle of 2 to 15 degrees. The axes of said passages are also preferably inclined transversely relative to the longitudinal bore axis at an angle of up to 20 degrees.

The fluid may comprise a gas such as air or a liquid.
15 Where air is used as the medium, the device may function as an air conveyor for conveying particulate materials or alternatively as a device for removing gas or fumes from an environment.

In the alternative, the medium may be water which is
20 used for conveying a liquid or a slurry along the bore of the device in the manner of a liquid pump.

Reference will now be made to the accompanying drawings which illustrate a preferred embodiment of the invention and wherein:-

25 Fig. 1 is a sectional elevational view of a conveyor according to the invention;

Fig. 2 is a longitudinal sectional view of the housing for the nozzle fitting of the conveyor;

Fig. 3 is an enlarged sectional view of the nozzle
30 fitting along line A-A of Fig. 1 showing the disposition of the passages therein; and

Fig. 4 is a perspective view of the nozzle fitting used in the embodiment of Fig. 1 showing its function.

Referring to the drawings and firstly to Fig. 1
35 there is illustrated a fluid operated conveyor 10 according to the present invention having an inlet tube 11 and an outlet tube 12 arranged coaxially with the inlet tube 11 and

communicating through a coaxially arranged annular nozzle fitting 13, the latter being located within a cylindrical housing 14 and being sealed at each end to the inner wall of the housing 14 and the opposite ends of the tubes 11 and 12
5 by means of O-ring seals 16 located in annular recesses 15 at each end of the fitting 13.

Each tube 11 and 12 is provided adjacent its inner end with an annular groove 17 and 18 respectively adapted to receive the two part annular halves 19 of a clamping plate
10 assembly 20. Each annular half 19 is provided with a series of circumferentially spaced apertures 21 for receipt of fastenings screws or bolts 22 which are adapted to engage with threaded holes 23 in opposite ends of the housing 14. One of the clamping plates 19 may include an extended bracket portion
15 24 to enable mounting of the device 10 in any desired attitude. Alternatively the mounting bracket 24 may comprise a separate mounting device which may be connected through the same holes 23 and fasteners 22 to the other end of the housing 14. It will be seen that when the screws 22 are tightened the inner
20 ends of each tube 11 and 12 will be forced into firm engagement with the opposite ends of the insert 13 so as to be sealed thereto with the aid of the seals 15.

The housing 14 as more clearly shown in Fig.2 is provided with a fluid inlet port 25 which extends through the
25 wall of the housing 14, and which is offset relative to the axis of the housing 14, the port 25 opening through the internal surface of the housing 14.

The nozzle fitting 13 as shown in Figs. 1, 3 and 4 is as stated above of annular form including in its outer surface,
30 an annular chamber 26 for receipt of fluid through the port 25, the chamber 26 when in its operative position in the housing 14 being aligned with the port 25. The fitting 13, apart from the chamber 26 and recesses for the seals 16 has an external cylindrical surface of substantially the same diameter as, or
35 of slightly smaller diameter than, the inner diameter of the housing 14.

On its inner surface, the fitting 13 includes adjacent

the leading thereof an inwardly tapered frusto-conical wall 27 which merges into a wall 28 of constant cross-section in the region of the chamber 26 and which is then stepped outwardly at 29 to define an annular frusto-conical shoulder 30 facing
5 downstream of the apparatus 10. The inner wall of the insert 13 from the outwardly stepped shoulder 30 again converges at 31 in a frusto-conical fashion to merge with a wall 32 of constant diameter immediately adjacent the inner end of the tube 12.

10 A series of passageways 33 extend through the fitting 13 from the chamber 26 to the interior of the fitting 13 opening through the shoulder 30, the passageways 33 being arranged at spaced apart circumferential positions about the chamber 26. The axes of the passageways 33 as shown more
15 clearly in Fig. 3 are inclined inwardly towards each other and additionally are inclined transversely with respect to the longitudinal axis of the device 10. Preferably the inclination of the axes of the passageways 33 is in the region of two degrees to fifteen degrees, to the longitudinal axis of the
20 device 10. The transverse inclination of the axes of the passageways 33 may be of an angle up to twenty degrees to the longitudinal axis of the device 10.

The inclination of the axes of the passageways 33 has the effect more clearly illustrated in Fig. 4. Fluid passing
25 through the passageways 33 converges frusto-conically towards the longitudinal axis of the tubular member 12 to a minimum cross-section or throat at which they diverge frusto-conically outwardly towards the inner surface of the tubular member 12. This creates within the tubular member 11 a region of reduced
30 pressure so as to provide a suction effect at the inlet end of the tubular member 11 so that say a material may be drawn into the member 11 for passage along the device 10 for discharge out of the member 12. Efficiency of operation is enhanced by the arrangement of the passageways 33 as defined
35 above.

The device of the present invention may be used as an

air conveying device in which case the fluid medium comprises air. The device may then be used for the conveyance of a particulate material or to remove gas such as fumes from a particular location. Alternatively, the device may be used as
5 an air blast device or blower.

Where the fluid medium is a liquid, the liquid is preferably water in which case the device may be used for conveying a further liquid or material entrained in the liquid along the bore.

10 In an alternative arrangement for securing the tubular members 11 and 12 to the housing 13, the members 11 and 12 may be provided with annular shoulders or enlargements adjacent their inner ends which may be clamped to the ends of the housing by a separate clamping element such as a clamping ring.
15 Alternatively, the annular enlargements may themselves be apertured so that the fasteners 22 may be passed therethrough into the threaded aperture 21.

Whilst the above has been given by way of illustrative embodiment of the invention, all such modifications and
20 variations thereto as would be apparent to persons skilled in the art are deemed to fall within the broad scope and ambit of the invention as herein defined in the appended claims.

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Claims

1. A conveying device including an elongated bore, a generally annular fitting arranged coaxially with, or within said bore, a fluid chamber adapted to be connected to a source
5 of pressurized fluid, a series of passageways in said fitting communicating with said chamber and said bore for directing fluid from said chamber in one direction along said bore, said passages having axes converging inwardly longitudinally of said bore and said axes being further inclined transversely relative
10 to the longitudinal axis of said bore so that fluid passing through said passages converges in its flow direction to a minimum at a throat region along said bore.
2. A conveying device according to Claim 1 wherein said
15 fluid receiving chamber is of annular form and communicates with a fluid inlet port extending outwardly of said device.
3. A conveying device according to Claim 2 wherein the axis of said inlet port is offset relative to the longitudinal
20 axis of said bore so as to create in said chamber an annular flow of fluid therearound.
4. A conveying device according to Claim 2 or Claim 3 wherein said chamber is formed in an external wall of said
25 fitting.
5. A conveying device according to any one of Claims 1 to 4 wherein said bore is defined by a pair of hollow members arranged coaxially with said fitting and at opposite ends
30 thereof.
6. A conveying device according to Claim 5 wherein said fitting is located within a cylindrical housing and there being provided clamping means for clamping the respective said hollow
35 members to opposite ends of said housing in alignment with said fitting.

7. A conveying device according to Claim 6 wherein said hollow members are provided with annular abutments at their ends adjacent said housing and wherein said clamping means cooperate with said abutments to secure said hollow
5 members to said housing.

8. A conveying device according to Claim 7 wherein said clamping means comprise at each end of said housing a pair of half annular clamp members adapted for engagement with said
10 abutments, said clamp members being arranged to be secured to opposite ends of said housing by screw fasteners or the like.

9. A conveying device according to claim 8 wherein said abutments comprise annular grooves in the outer walls of said
15 hollow members.

10. A conveying device according to any one of the preceding claims wherein the axes of said passages are inclined inwardly towards the longitudinal axis of said bore at an angle
20 of 2 to 15 degrees.

11. A conveying device according to any one of the preceding claims wherein the axes said passages are inclined transversely relative to said longitudinal axis at an angle of
25 up to 20 degrees.

12. A conveying device substantially as hereinbefore described with reference to the accompanying drawings.

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Patents Act 1977
 Examiner's report to the Comptroller under
 Section 17 (The Search Report)

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Relevant Technical fields

- (i) UK CI (Edition K) B8A - A3AG, A3AH, A3AX
- (ii) Int CI (Edition 5) B65G

Search Examiner

B J THOMAS

Databases (see over)

- (i) UK Patent Office
- (ii) ONLINE DATABASE: WPI

Date of Search

20 AUGUST 1992

Documents considered relevant following a search in respect of claims

1-12

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
X	GB 805956 (WESTIN - BACKLUND) See Figure 6	1-3



Category	Identity of document and relevant passages	Relevant to claim(s)

Categories of documents

X: Document indicating lack of novelty or of inventive step.

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