April 14, 1964 M. E. GRIMES 3,128,629

MATERIAL SAMPLING APPARATUS

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Fig. 1.

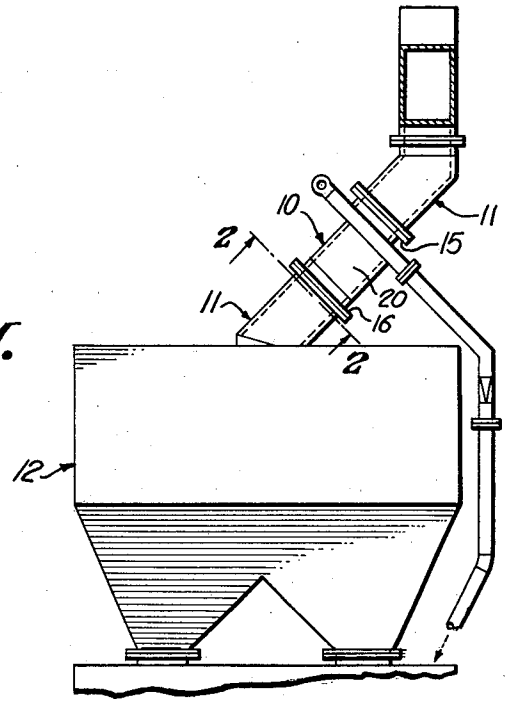
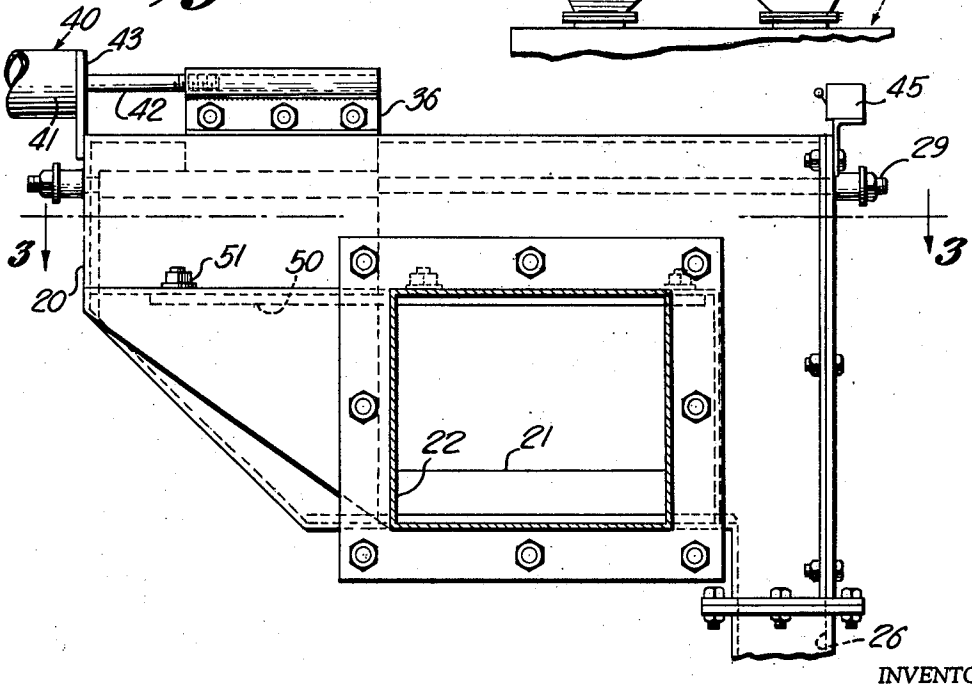


Fig. 2.



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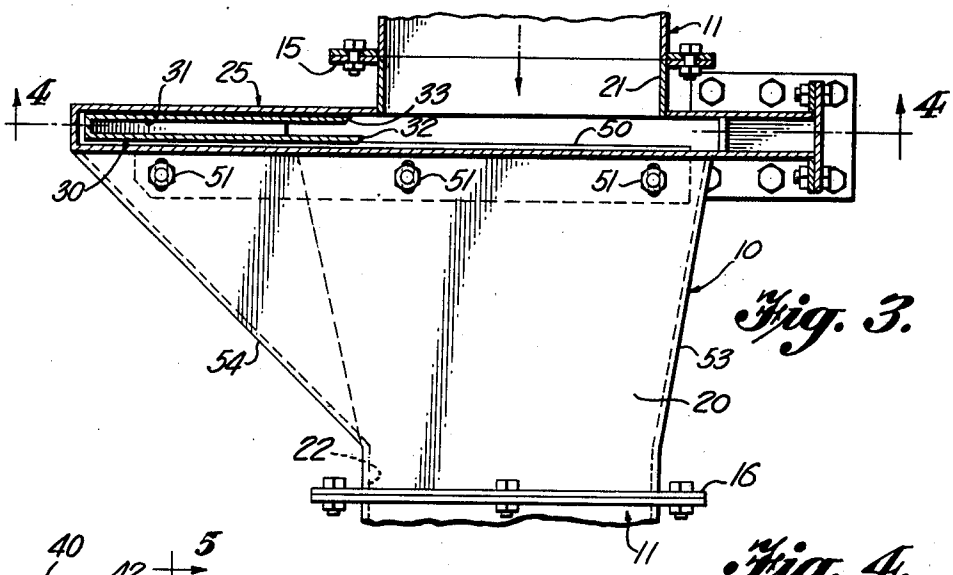


Fig. 3.

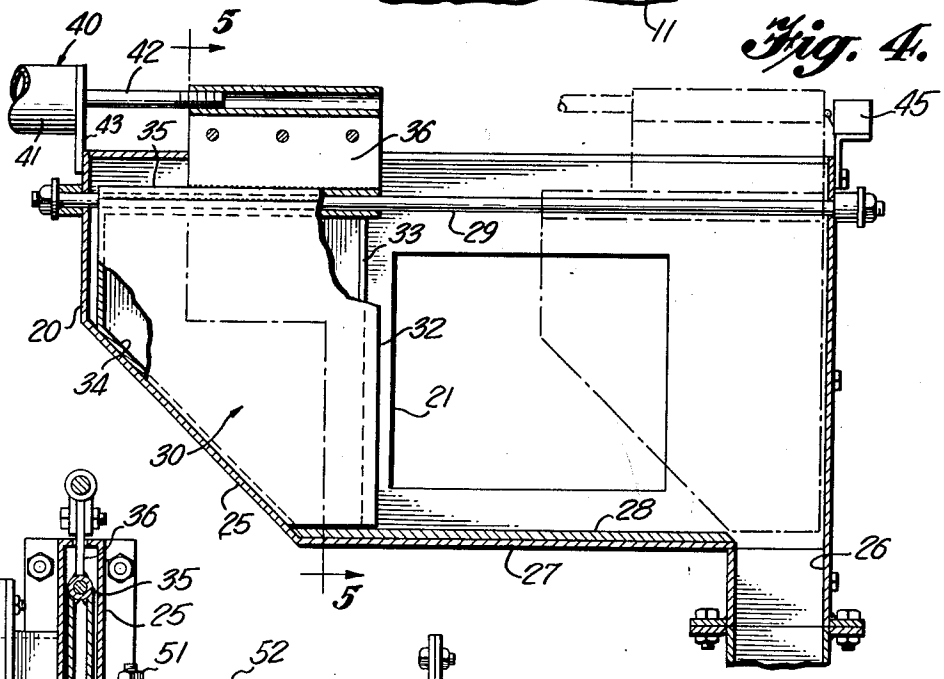


Fig. 4.

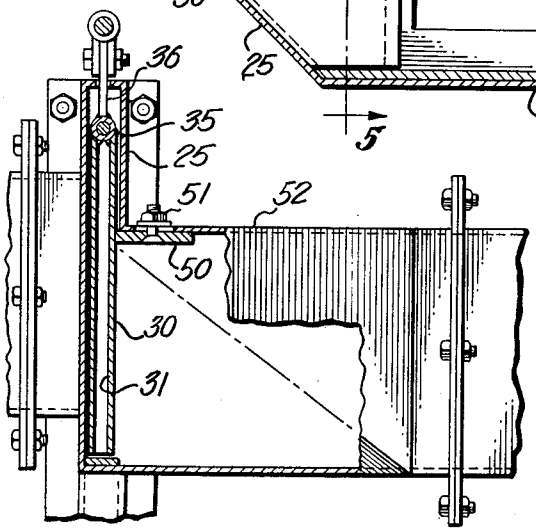


Fig. 5.

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MATERIAL SAMPLING APPARATUS

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5 Claims. (Cl. 73—423)

This invention is directed generally to obtaining samples from a stream of material. More specifically, the invention relates to apparatus for periodically removing representative samples of particulate material from a stream of material and is especially useable with a moving stream of material such as one passing along a chute or on a moving belt conveyor.

In many process industries and manufacturing operations, there arises the need for periodically sampling streams of materials which are being employed or acted upon as a step or part of the particular process or manufacturing operation being carried out. An example of an instance wherein such need arises is in conjunction with insuring quality control of the proficiency with which the process or operation is being carried out. Removing representative samples from a flowing stream of material at predetermined intervals enables determination from these samples of the character of the material in the stream such as the ranges of particle sizes, chemical makeup, etc. This information may then be employed in adjusting or maintaining uniform the particular process or operation in which the stream of material is used.

There are certain prerequisites which must be met by a sampling apparatus in obtaining periodic representative samples from a stream of material. The sample must be removed from the stream without unduly interrupting or interfering with the continuing movement of the stream. Additionally, the sample, to be truly representative of the material in the stream, must be made up of equal increments of material taken from each portion of the cross section of the stream flow.

In recognition of the attributes of a sampling apparatus necessary to obtaining periodic representative samples of a stream of material, the instant invention has been conceived with the principal objective of providing improved apparatus which will be operative to obtain the desired representaive samples with the samples being taken at predetermined intervals from the stream of material with minimum interference with or disturbing of the material stream.

A further object is to provide apparatus for removing a sample from a stream of material which apparatus employs a sample cutter movable generally transversely across the stream of material to effect removal of the sample.

It is also an object of this invention to provide a sample cutter in conjunction with apparatus as defined in the above object with such cutter being shaped so as to not stop the stream flow as the sample is removed.

Another object of the invention is to provide a sampling apparatus incorporating a sample cutter which is readily changeable to accommodate the removal of different quantity samples and be employed with material streams having different sized particles.

A further object of the instant invention resides in providing a sampling apparatus having a transversely movable sample cutter with an offset chute bottom provided in the apparatus housing to insure complete cutting of the stream in removing the sample by transverse movement of the cutter and wherein the housing outlet sides are flared to preclude trapping or build-up of the material of the stream as it passes through the housing.

An additional object of the instant invention involves the provision of a sample cutter useable in sampling apparatus in accordance with the above objects wherein the leading edge of the cutter is formed to promote the cutting and removing of a sample from the stream of material.

The above and other objects and novel features of the instant invention will be more readily apparent from the following decription taken in conjunction with the accompanying drawings. It is to be expressly understood, however, that the drawings are for the purpose of illustration only and are not intended to define the limits of the invention, but rather to merely illustrate a preferred embodiment and structure incorporating the novel features of the instant invention.

In the drawings wherein like reference characters refer to like parts throughout the several views:

FIGURE 1 is a side elevational view showing the sampling apparatus of the instant invention associated with an inclined chute through which a stream of particulate material flows.

FIGURE 2 is a sectional view taken on line 2—2 of FIGURE 1;

FIGURE 3 is a sectional view taken on line 3—3 of FIGURE 2;

FIGURE 4 is a sectional view taken on line 4—4 of FIGURE 3, and

FIGURE 5 is a sectional view taken on line 5—5 of FIGURE 4.

FIGURE 1 illustrates one manner in which the sampling apparatus of the instant invention may be employed to effect removal of samples from a stream of material. In FIGURE 1, the sampling apparatus 10 is shown connected in the flow path of an inclined chute 11. The material to be sampled may be fed into the upper end of chute 11 as, for example, by a suitable conveying means (not shown) while the product discharges from the lower end of the chute 11 into a suitable hopper 12.

It is to be understood that the arrangement in FIGURE 1 is merely one manner in which the sampling apparatus of this invention may be employed. The apparatus of this invention can be installed or incorporated with any size or shape chute in a horizontal, vertical or inclined position. It is to be further understood that the apparatus as will be described in detail hereinafter may be used for removing samples from any stream of materials such as a stream carried on a moving belt conveyor. In any installation, it is required that the sample cutter be properly mounted to be movable transversely through the stream of material to effect removal of a sample. It is thus contemplated that these alternative applications of the sampling apparatus disclosed herein are to be embraced within the scope of the appended claims.

Referring again to FIGURE 1, the sampling apparatus 10 is connected as by means of suitable flanges 15 and 16 in the flow path of chute 11 so that the stream of material flowing downwardly through inclined chute 11 enters the inlet opening surrounded by flange 15 and passes through the outlet opening surrounded by flange 16 into the lower portion of chute 11.

The sampling apparatus as shown more clearly in FIGURES 2 through 5 includes a housing 20 provided at 21 with an inlet opening and at 22 with an outlet opening. In the installation shown in FIGURE 1, the flange 15 connects the inlet opening 21 to the upper portion of chute 11 while flange 16 connects the outlet opening 22 to the lower portion of chute 11.

Housing 20 includes a pocket 25 which is formed therein between the openings 21 and 22 and is disposed to extend transversely of the path of material flow. This pocket provides an enclosure portion at one side of the material flow path for a sample cutter 30 and at the opposite side of the flow path has formed therein a sample

discharge chute 26. The bottom 27 of pocket 25 is disposed below the level of inlet opening 21 and has mounted thereon a wear plate 28, across which the sample cutter 30 moves in removing a sample from the stream of material flowing into the housing through inlet opening 21. A guide rod 29 is mounted within pocket 25 to extend transversely above the opening 21 and provide a guide along which cutter 30 is slidable.

Referring to the construction of the sample cutter 30, such element is formed with a chamber 31 which is open at its leading end and closed at its trailing end as shown in FIGURES 3 and 4. Particular note should be made with respect to the formation of the bottom wall 34 of the cutter which is inclined upwardly from the leading open end such that a generally triangular cross section in the plane of movement of the cutter is provided. This formation is important in that it reduces the obstruction or interruption to flow of the stream when the sample is being taken.

Also, as shown in phantom in FIGURE 4, when the cutter is disposed at the opposite end of pocket 25, to discharge the sample into chute 26, the cutter does not obstruct continued movement of the stream of material through the housing. Thus, the cutter, once actuated, may be held above chute 26 for a period of time to insure full discharge of the sample into sample chute 26.

Referring to the leading end of the chamber 31, it will be noted that the edges at this leading end are bevelled at 32 and 33 in the downstream direction of flow of material. This formation of the edges improves the action of the cutter in removing a sample from the stream. Also, the upstream edge 33 is set back from the downstream bevelled leading edge 32. Thus in movement of the cutter 30 across the material stream, the sample will be more effectively guided into chamber 31 within the cutter.

The upper end of cutter 30 is formed with a sleeve 35 which slidably engages over rod 29. A flange 36 extends upwardly from sleeve 35 and is connected to an actuator mechanism which effects movement of the cutter 30 transversely of the material stream.

In the particular embodiment illustrated, the actuator mechanism for the cutter 30 is provided by an air cylinder unit 40 including an air cylinder and piston 41 and piston rod 42. The unit 40 is suitably mounted on the housing 20 by a plate 43 connected to cylinder 41 while rod 42 is connected to flange 36. With this type of actuator unit, the introduction of air into cylinder 41 causes rod 42 to be extended and in so doing, moves the cutter 30 along pocket 25, carrying the cutter across the stream of material to remove a sample.

A limit switch 45 is mounted on the opposite end of pocket 25 to be engaged by flange 36. This switch is suitably connected into the control of air cylinder unit 40 to interrupt operation of the unit at the end of its stroke and while the cutter discharges the collected sample into the sample discharge chute 26. Thereafter, air is introduced into the opposite end of cylinder 41 to retract rod 42 and thereby withdraw the cutter 30 back into the enclosure portion of pocket 25.

Although an air cylinder actuator unit 40 has been illustrated, it will be understood that within the scope of the instant invention, other suitable actuators may be employed to effect reciprocating movement of sample cutter 30 within pocket 25 to obtain samples.

To assist in the guiding of cutter 30, a guide rail 50 is adjustably mounted by threaded fasteners 51 on the upper wall 52 of housing 20. This rail is slideably engaged by the cutter 30 so that as the cutter moves transversely across the stream of material, the rail will assist in holding it against being displaced by the flow of material through the apparatus.

The formation of pocket 25 in housing 20 and the fact that the bottom 27 of this pocket is disposed beneath the housing inlet opening 21 has been described hereinabove. A further important feature in the housing 20 resides in

the flared relation of the side walls 53 and 54 on the downstream side of pocket 25. These side walls converge toward the outlet opening 22 and thus provide an enlarged area downstream from the sample cutter 30. This construction reduces the possibility of build up or accumulation of material from the stream as it flows through the apparatus. Thus, in the illustrated embodiment, the stream passes through housing 20 and a sample is removed therefrom by movement of cutter 30 transversely of the path of the material stream while the converging side walls 53 and 54 guide the material stream to outlet opening 22.

In operation of the apparatus, the cutter 30 is positioned in the enclosure portion of pocket 25 at one side of the openings 21 and 22. When a sample is to be obtained, the actuator unit 40 is energized and the cutter thereby moved transversely across the stream to remove a cross sectional sample of the stream passing through the housing. When the cutter has travelled across the stream, limit switch 45 is actuated and further movement terminated. In this position, the cutter empties the sample into sample discharge chute 26.

After emptying the sample, the cutter may be immediately withdrawn and positioned in the enclosure portion of pocket 25 in readiness to remove another sample. On the other hand, if desired, the cutter 30 may be held in the position shown in phantom on FIGURE 4 between actuations to remove successive samples. When the cutter is so positioned, it serves to block any material of the stream tending to flow laterally and into chute 26.

It will be understood that the operations of the sampler device may be carried out in accordance with a timed cycle such that at predetermined timed intervals, the cutter will be moved back and forth across the stream of material to remove a sample. The samples removed flow through chute 26 from which they may be taken for effecting the desired analysis of the sample contents as may be required.

I claim:

1. Apparatus for sampling a stream of material comprising

a housing connectable to receive the stream of material and having inlet and outlet openings to accommodate flow of the material in a longitudinal flow path through said housing,

a sample cutter having spaced side walls with an open leading end and a rear wall closing the trailing ends of said side walls defining an elongated sample receiving chamber therein,

means mounting said sample cutter to be reciprocable generally normal to said flow path with the longitudinal dimension of said sample receiving chamber coincident with the direction of reciprocation of said sample cutter and the open leading end facing in said direction of reciprocation,

means for reciprocating said sample cutter between a first position whereat said cutter is disposed to one side of said flow path with said open leading end facing said flow path and a second position whereat said cutter is disposed on the opposite side of said flow path,

and a sample discharge duct disposed at said opposite side of said flow path to receive a sample of the material from said chamber upon movement of said cutter from said first position to said second position.

2. Apparatus as recited in claim 1 wherein said sample cutter has a bottom wall inclined upwardly from said open leading end to provide the sample receiving chamber with a generally triangular cross section in the plane of reciprocable movement of said cutter.

3. Apparatus as recited in claim 1 wherein the leading edges at the open end of the cutter chamber are bevelled with the leading edge at the upstream side of the sample receiving chamber being set back from the leading edge at the downstream side of the sample receiving chamber.

4. Apparatus for sampling a stream of material comprising

a housing connectable to receive the stream of material and having inlet and outlet openings to accommodate flow of the material in a longitudinal flow path through said housing,

a pocket formed in said housing between said openings and extending traversely of the path of material flow through said housing, said pocket having the bottom wall thereof disposed beneath the lower edge of said inlet opening and substantially level with the lower edge of said outlet opening,

a sample cutter having spaced side walls with an open leading end and a rear wall closing the trailing ends of said side walls defining an elongated sample receiving chamber therein,

said cutter having the lower edge thereof disposed closely adjacent said bottom wall of said pocket,

means mounting said sample cutter to be reciprocable generally normal to said flow path with the longitudinal dimension of said sample receiving chamber coincident with the direction of reciprocation of said sample cutter and the open leading end facing in said direction of reciprocation,

means for reciprocating said sample cutter between a first position whereat said cutter is disposed to one side of said flow path with said open leading end facing said flow path and a second position whereat said cutter is disposed on the opposite side of said flow path,

and a sample discharge duct disposed at said opposite side of said flow path to receive a sample of the material from said chamber upon movement of said cutter from said first position to said second position.

5. Apparatus as recited in claim 4 wherein a guide rod is mounted longitudinally of said pocket to extend transversely above said openings to permit the stream of material to flow therebeneath, said cutter carries a sleeve member slideably engaged with said rod to mount said cutter, and a guide rail is mounted on said housing on the downstream side of said pocket to be slideably engaged by said cutter and thereby assist in supporting said cutter against the force of the stream as the sample is being taken.

References Cited in the file of this patent

UNITED STATES PATENTS

2,421,938	Held	June 10, 1947
2,495,944	Pletta et al.	Jan. 31, 1950