

Improvements in a relating to a batch material blender

This invention relates to an apparatus for, and method for, blending together a variety of appropriate materials in specific but variable quantitative relationships. More particularly the apparatus is intended for use in connection with the extrusion moulding or casting of thermoplastics or other like materials wherein it is desired to blend together virgin and reprocessed plastic materials with a colour concentrate or a plurality of such concentrates.

In the moulding or formation of articles from mouldable resins or plastic materials, the raw materials or resins (virgin and/or reprocessed) and masterbatched colourants used are usually in comminuted or granulated form. In feeding these to, for example, an injection moulding machine, it is imperative that the materials be accurately measured to assure consistency in the product produced. Difficulties have been encountered in providing a satisfactory material metering or measuring means which will achieve this result in as speedy and predictable fashion as is required on a commercially practicable operation.

The present invention seeks to provide apparatus including a combined material measuring and transferring means wherein an accurate measure or quantity of comminuted material may be quickly and automatically made and transferred to a position or station for conveyance into barrel and dies of a moulding machine.

Thus it will be appreciated that a preferred embodiment of this invention ~~resides~~ comprises a combined measuring and transferring device for use in supplying raw materials, such as are enumerated above, to moulding

machines and which simultaneously measures a plurality of material quantities. Each measuring device or unit is independently adjustable thereby enabling the user to vary independently the quantities of raw materials supplied or transferred by each measuring unit to the moulding machine
5 hopper and batch feeder.

In one material measuring and transferring device in accordance with the invention a plurality of differing moulding machine batch materials may be quickly and accurately blended without intermediate handling as they move from their independent bulk storage locations to each mould-
10 ing machine hopper.

According to one aspect of this invention there is provided a material measuring and transferring device for transferring respective predetermined quantities of at least two supplies of comminuted material to a moulding apparatus, the said device comprising a top plate, a bottom plate, a rotary
15 conveyor member positioned therebetween for rotation relative thereto, and a driving means for the conveyor member, the conveyor member having at least two trap chambers each adapted to receive material from a respective said supply and each extending between top and bottom surfaces of the conveyor member, one of the said trap chambers having
20 a fixed volumetric capacity and the other having an adjustable volumetric capacity, the said bottom plate comprising at least one aperture with which the trap chambers communicate during certain segments of rotation of the said conveyor member, and the top plate comprising at least two
25 inlet passageways for placing the trap chambers respectively in communication with one of the said supplies of material during rotation of the conveyor member.

Conveniently one of the said trap chambers is radially offset from the or each other said trap chamber and the trap chambers are aligned with said at least one aperture during certain segments of rotation of
30 the conveyor member to dispense the material.

Advantageously one trap chamber is arcuate and is adapted to be aligned with a first said top inlet passageway and the other trap chamber is adapted to be aligned with a second said top inlet passageway.

Preferably the conveyor member supports a closure member for
35 adjusting the volumetric capacity of the said variable capacity trap chamber.

Preferably the said closure member comprises an adjustable bar movable in the said variable capacity trap chamber by a screw.

Advantageously a peripheral surface of the conveyor member is a configured cam surface.

5 Advantageously the apparatus additionally comprises: yet an additional passageway and aperture respectively in the said top and bottom plates; a feed means positioned between the said plates and comprising an orifice movable between a position of alignment with the said additional passageway and a position of alignment with the said additional aperture;
10 and an actuator means for moving the feed means as said.

Preferably a cam follower is positioned for adjustable engagement with said cam surface, and a control means is provided interconnected with said cam follower and said actuator means to control the said actuator means in response to the interrelationship of said cam surface and cam
15 follower.

Conveniently the said actuator means is comprised of a fluid motor and the said control means is a valving device.

Preferably said cam follower is pivotally adjustable so that the degree of engagement with said cam surface may be varied.

20 Conveniently suitable conduits are affixed to said top plate and respectively overlie said plurality of passageways to accommodate the delivery of comminuted mouldable material thereto.

The invention also relates to a combination of a moulding apparatus having a mouldable material hopper as an integral part thereof and a
25 material measuring and transferring device as described above.

According to another aspect of this invention there is provided a method of simultaneously measuring and transferring a plurality of comminuted mouldable materials to a moulding apparatus from a device comprising a rotary conveyor member having at least two trap chambers,
30 at least one of which chambers has an adjustable volumetric capacity and another of which has a fixed volumetric capacity, the said method including the steps of:

- (1) adjusting the volumetric measuring capacity of the or each adjustable capacity chambers to a predetermined value;
- 35 (2) delivering a plurality of comminuted mouldable materials to the trap chambers;

(3) rotating the said conveyor so that measured volumes of material are discharged from the trap chambers to the moulding apparatus; and

(4) intermingling the said materials at and subsequent to the said discharge thereof.

5 Preferably the material delivered as said to the or each adjustable capacity trap chamber differs from that delivered as said to the or each fixed capacity trap chamber.

10 Conveniently the said device is provided with a volumetrically adjustable feed means, the method including the additional but not necessarily subsequent steps of:

(1) adjusting the volumetric measuring capacity of the said feed means;

(2) delivering comminuted mouldable material to the said feed means;

15 (3) moving the said feed means so that a measured volume of material is discharged therefrom; and

(4) intermingling the material from the feed means with the said materials discharged from the said conveyor.

In order that the invention may be more readily understood, and so that further features thereof may be appreciated the invention will now be described by way of example with reference to the accompanying drawings, in which.

Figure 1 is a top perspective view of a measuring and transferring device in accordance with the invention shown in position on a moulding machine hopper and connected to hose delivery members which are adapted to convey materials thereto;

Figure 2 is a top plan view of the device of Figure 1;

Figure 3 is an exploded perspective view of the measuring and transferring device of Figure 1 illustrating the metering and transfer elements of the device as well as their interrelationships;

Figure 4 is yet another exploded view similar to Figure 3 which further reveals the interrelationship of the various elements;

Figure 5 is a cross-sectional view taken along line 5-5 of Figure 1 which illustrates the transfer of metered materials from the device to the moulding machine hopper;

Figure 6 is a further partial cross-sectional perspective view related to Figure 5 and with certain elements removed for purpose of clarity which shows how separate materials are discharged through a single aperture;

Figure 7 is a partial cross-sectional view taken along line 7-7 of Figure 3 which more completely depicts the adjustment features of one of the measuring and transference elements of the device;

Figure 8 is partial cross-sectional view of another of the measuring and transference elements of the device taken along line 8-8 of Figure 1;

Figure 9 is a further partial cross-sectional perspective view related to Figure 8 illustrating the transfer mode of such element;

Figure 10 is a partial perspective view of the controlling arrangement for the measuring and transfer

element shown in Figures 8 and 9; and

Figure 11 is an additional plan view of the controlling arrangement illustrating the adjustable features thereof.

5 While one embodiment of the invention is illustrated which may be preferred for measuring, transferring and feeding or discharging resinous raw materials to a moulding machine, it is to be understood that the principles of the invention may be incorporated with any apparatus
10 where the same may be found to have utility.

Referring now to Figures 1, 2, 3 and 4 one may obtain a better appreciation of the overall construction of a measuring and transferring device 10 adapted for incorporation upon an integral hopper 11 of any suitable moulding
15 apparatus. Furthermore, with particular reference to Figures 3 and 4, the device may be seen to incorporate a conveyor member 12 as one of its principal elements. This member 12 is preferably of a circular configuration with a top surface 13, a bottom surface 14 and a peripheral surface 15.
20 Likewise, it is to be noted that member 12 is rotably movable about an axis 16 and includes a plurality of arcuate, slot-like openings 17 positioned by equal radial distances from member axis 16 and which extend between the top and bottom surfaces 13, 14.

25 In addition, the member 12 also has another opening 18 extending between the surfaces 13, 14, which opening is radially offset from the arcuate slot-like openings 17. The latter mentioned radially offset opening 18 may have its volumetric capacity varied by closing means, such as a
30 bar 19. The bar 19 includes a runner 20 of a width approximating that of opening 18, a depending tongue 21 of similar width and of a height approximating the thickness of conveyor 12 and a control lip 22 at the opposite end of runner 20 from tongue 21 (Figure 7).

35 The bar 19, including tongue 21 and portions of runner 20, is positionable in opening 18 and is slidably movable there by some suitable adjustment means, for example, a screw

23. The screw 23 is threaded into the conveyor 12 by way of a tapped hole 24 and a hemispherical slot 25 in the bar lip 22 which adapted for engagement with the screw 23 between the threaded portion 26 and head 27 thereof.

5 Accordingly, by rotating the screw 23 the bar 19 is movable longitudinally within and across the top of the opening 18 from a position ^{defining a} maximum ~~defining a~~ volumetric capacity for the opening 18 to a position ~~defining~~ zero capacity for the opening 18. To assist the user in properly
10 positioning the bar 19 it is envisaged that suitable indicia will be placed thereon to identify various selected volumes of the opening 18.

The conveyor member 12 is supported on a bottom plate 28 which has a principal aperture 29 and an additional
15 aperture 30 therethrough (Figure 4). As is apparent, in certain positions of the conveyor member 12, the openings 17 and 18 in the conveyor member will overlie the aperture 29 and whatever materials have been accumulated in those openings will obviously exit through opening 29 by means
20 of gravity. This plate 28 is additionally constructed to support another feed means 31 that is comprised of a slide 32, actuator means 33, for example, a fluid motor (e.g. a piston and cylinder device) and guide rails 34 (Figures 8 and 9).

25 The slide 32 includes an orifice 35 therethrough which orifice is adapted in one position to accumulate a pre-determined volume of material (based upon the orifice dimensions) and in yet another position to discharge such material through an aperture 30 in the bottom plate 28.
30 The movement of the slide between these respective positions is effected by the fluid motor 33 and the guide rails 34 maintain the proper slide alignment.

Additionally, plate 28 mounts a control means 36 (Figures 10 and 11) which activates the fluid motor 33
35 and thus controls the various movements of the slide 32. The control means 36 includes a microswitch or similar arrangement 37 which is fixed to a support plate 38. The

switch 37 further includes a cam follower 39 that is adapted to ride on the peripheral surface of conveyor member 12. In the preferred embodiment the peripheral surface of conveyor 12 incorporates a plurality of grooves 40 into which cam follower 39 may project during conveyor rotation. Accordingly, this peripheral surface effectively acts as a cam whose configuration controls the operation of slide 32 through switch 37, motor 33 and whatever other circuitry or the like may be selectively included to achieve the desired operative motions.

As ~~has~~^{has} been indicated previously, it is an objective of the invention to be able to vary quantitatively the amount of material measured into and conveyed to the moulding machine hopper 11. (Figures 1 and 5). This object is also desired in the operation of feed means 31 and is achieved by pivotally mounting support plate 38 to bottom plate 28 (Figures 3, 4, 10 and 11). This is accomplished by arcuately slotting support plate 38 as at 41 and mounting that plate to plate 28 by means of cap screws 42 or some similar hold-down device, one of which passes through the slot 41. The other of the two hold-down devices therefore, acts as a pivot point (Figures 3 and 10) about which plate 38 may restrictively rotate thereby selectively positioning cam follower 39 with respect to conveyor 12. By such positioning the degree of engagement of follower 39 with the peripheral wall is selectively controlled. Furthermore, each of the mentioned grooves 40 is of a different depth and this similarly affects the interrelationship between these parts (Figure 11).

The conveyor member 12, closing means 19 and feed means 31 are all further sandwiched by a top plate 43 which is fixedly spaced from the bottom plate 28 by posts 44. The top plate 43 exhibits first, second and third passageways 45, 46 and 47 respectively, which extend therethrough. Passageway 45 is aligned and cooperates with openings 17 in the conveyor member 12 while passageway 46 similarly relates to radially offset opening 18. ~~and~~ Additionally,

the passageway 47 aligns and cooperates with orifice 35 in slide 32.

The top plate 43 therefore, acts as the inlet control means for the measuring and transfer device 10 while the bottom plate 28 controls the discharge of conveyed material. Of course, the device 10 also includes a driving means 48 which may take any typical motor form. The motor 48 is positioned on the top plate 43 with its driving axle 49 protruding through the top plate 43 and through the conveyor member 12 and into the bottom plate 28. The axle 49 is of course keyed to the conveyor 12 so that its rotation effects the conveyor rotation.

Furthermore, to assist in the orderly transfer of material to device 10 there are affixed to the top plate 43 a plurality of stub-like conduits 50. These overlies the respective passageway 45, 46 and 47 and are sized to accept and retain delivery hoses which lead to material bulk storage bins.

In operation of the device selected materials for use in the moulding machine will be conveyed to the measuring and transferring device 10 via delivery hose systems. A continuous supply of such materials will therefore, be available at and in conduits 50. Motor 48 which is intermittently operable dependent upon the amount of material in hopper 11, rotably moves conveyor member 12 in which the openings 17 and 18 have been set to accommodate predetermined amounts of material. During this movement, openings 17 and 18 traverse beneath passageways 45 and 47 and conduits 50 and are thus filled with the respective materials. As rotation continues, these same openings align with aperture 29 thereby effecting material discharge into hopper 11.

Simultaneously, with and due to the rotation of conveyor 12, feed means 31 will be activated and its degree of reciprocal movement will be determined by the setting of plate 38. That setting will control which of the grooves 40 will determine the movement of slide 32. Nonetheless, during

each revolution of axle 49 conveyor 12 will measure predetermined quantities of two materials and transfer same to hopper 11.

Any suitable controlling means may be employed to effect the operation described.



CLAIMS:

1. A material measuring and transferring device for transferring
respective predetermined quantities of at least two supplies of comminuted
5 material to a moulding apparatus, the said device comprising a top plate,
a bottom plate, a rotary conveyor member positioned therebetween for
rotation relative thereto, and a driving means for the conveyor member,
the conveyor member having at least two trap chambers each adapted
to receive material from a respective said supply and each extending
10 between top and bottom surfaces of the conveyor member, one of the
said trap chambers having a fixed volumetric capacity and the other
having an adjustable volumetric capacity, the said bottom plate comprising
at least one aperture with which the trap chambers communicate during
certain segments of rotation of the said conveyor member, and the top
15 plate comprising at least two inlet passageways for placing the trap chambers
respectively in communication with one of the said supplies of material
during rotation of the conveyor member.
2. A material measuring and transferring device according to claim
20 1, wherein one of the said trap chambers is radially offset from the or
each other said trap chamber and the trap chambers are aligned with
said at least one aperture during certain segments of rotation of the
conveyor member to dispense the material.
- 25 3. A material measuring and transferring device according to claim
1 or 2, wherein one trap chamber is arcuate and is adapted to be aligned
with a first said top inlet passageway and the other trap chamber is adapted
to be aligned with a second said top inlet passageway.
- 30 4. A material measuring and transferring device according to any
one of the preceding claims wherein the conveyor member supports a
closure member for adjusting the volumetric capacity of the said variable
capacity trap chamber.
- 35 5. A material measuring and transferring device according to claim
4 wherein the said closure member comprises an adjustable bar movable
in the said variable capacity trap chamber by a screw.



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6. A material measuring and transferring device according to any one of the preceding claims wherein a peripheral surface of the conveyor member is a configured cam surface.
- 5 7. A material measuring and transferring device according to any one of the preceding claims additionally comprising: yet an additional passageway and aperture respectively in the said top and bottom plates; a feed means positioned between the said plates and comprising an orifice
10 movable between a position of alignment with the said additional passageway and a position of alignment with the said additional aperture; and an actuator means for moving the feed means as said.
- 15 8. A material measuring and transferring device according to claim 7 when dependent on claim 6 wherein a cam follower is positioned for adjustable engagement with said cam surface, and a control means is provided interconnected with said cam follower and said actuator means to control the said actuator means in response to the interrelationship of said cam surface and cam follower.
- 20 9. A material measuring and transferring device according to claim 8 wherein said actuator means is comprised of a fluid motor and said control means is a valving device.
- 25 10. A material measuring and transferring device according to claim 8 or 9 wherein said cam follower is pivotally adjustable so that the degree of engagement with said cam surface may be varied.
- 30 11. A material measuring and transferring device according to any one of the preceding claims wherein suitable conduits are affixed to said top plate and respectively overlie said at least two passageways to accommodate the delivery of comminuted mouldable material thereto.
- 35 12. In combination, a moulding apparatus having a mouldable material hopper as an integral part thereof and a material measuring and transferring device according to any one of the preceding claims.

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13. A method of simultaneously measuring and transferring a plurality of comminuted mouldable materials to a moulding apparatus from a device comprising a rotary conveyor member having at least two trap chambers, at least one of which chambers has an adjustable volumetric capacity and another of which has a fixed volumetric capacity, the said method including the steps of:

- (1) adjusting the volumetric measuring capacity of the or each adjustable capacity chambers to a predetermined value;
- (2) delivering a plurality of comminuted mouldable materials to the trap chambers;
- (3) rotating the said conveyor so that measured volumes of material are discharged from the trap chambers to the moulding apparatus; and
- (4) intermingling the said materials at and subsequent to the said discharge thereof.

14. A method according to claim 13 wherein the material delivered as said to the or each adjustable capacity trap chamber differs from that delivered as said to the or each fixed capacity trap chamber.

15. A method according to claim 13 or 14 wherein the said device is provided with a volumetrically adjustable feed means, the method including the additional but not necessarily subsequent steps of:

- (1) adjusting the volumetric measuring capacity of the said feed means;
- (2) delivering comminuted mouldable material to the said feed means;
- (3) moving the said feed means so that a measured volume of material is discharged therefrom; and
- (4) intermingling the material from the feed means with the said materials discharged from the said conveyor.

16. A method according to claim 15 wherein the said movement of the feed means is dependent on the rotary movement of the conveyor.

17. A material measuring and transferring device substantially as herein described with reference to and as shown in the accompanying drawings.



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18. A method of measuring and transferring materials substantially as herein described with reference to the accompanying drawings.

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The following corrections were allowed under Section 117 on 11 July 1984:

Front page, Heading (54) Title of invention *for* a (first occurrence) *read* or

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