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HOOVER AUTOMATIC MULLER MODEL M-5

INSTRUCTIONS FOR OPERATION

TO OPERATE:

1. Plug machine into proper power source.
2. Operating level (#9) should be in the down position.
3. Lift back upper plate, first depressing locking bracket (#14). Rest against upright metal rod.
4. Mix dry pigment and vehicle to form paste, spreading over lower plate. Quantities up to five grams can be mulled, depending on bulking and oil absorption.
5. Swing upper plate down into position, being sure that catch (#14) is securely locked. **DO NOT RUN PLATES DRY.**
6. Raise lower lever (#9) until spring bolt seats into hole provided in upright standard. This lifting will require some effort according to weights being used. Two slotted weights are provided, each being equal to 50 pounds when placed on to the permanent 50 pound weight. Hence, pressure may be 50 – 100 – 150 pounds as required by test procedures. The recommended pressure is the 50 pound permanent weight.
7. Push "**START**" button located on top of counter box. Machine will stop at the end of its prescribed run. Emergency "**STOP**" button is located in the same area.
8. When machine has stopped, release spring bolt (#23) and push down lever (#9), thereby breaking the suction between plates and allowing weights to rest on base.
9. Again, raise the upper plates as described in Step 3. With spatula, thoroughly scrape upper and lower plates and mix. Repeat process of mulling as many times as desired. There should be at least two mullings to secure a good mixture. **DO NOT RUN PLATES DRY.**

SETTING OF COUNTER:

The predetermining count is selected using the bi-directional pushbutton selector switches located on the number display in the face of the counter. The counter is preset at a period of 25 turns, which is the recommended cycle. Depending on test procedures, 50, 75 or 100 turns can easily be set into the counter by pushing the pushbutton selector switches.

(Continued)

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INSTRUCTIONS FOR OPERATION

(Continued)

OILING:

MOTOR: Oil as shown on attached cards.

CHAIN: Rub grease on chain once per month. As a precaution, disconnect electric current when this is done. It is not necessary to remove chain guard when greasing.

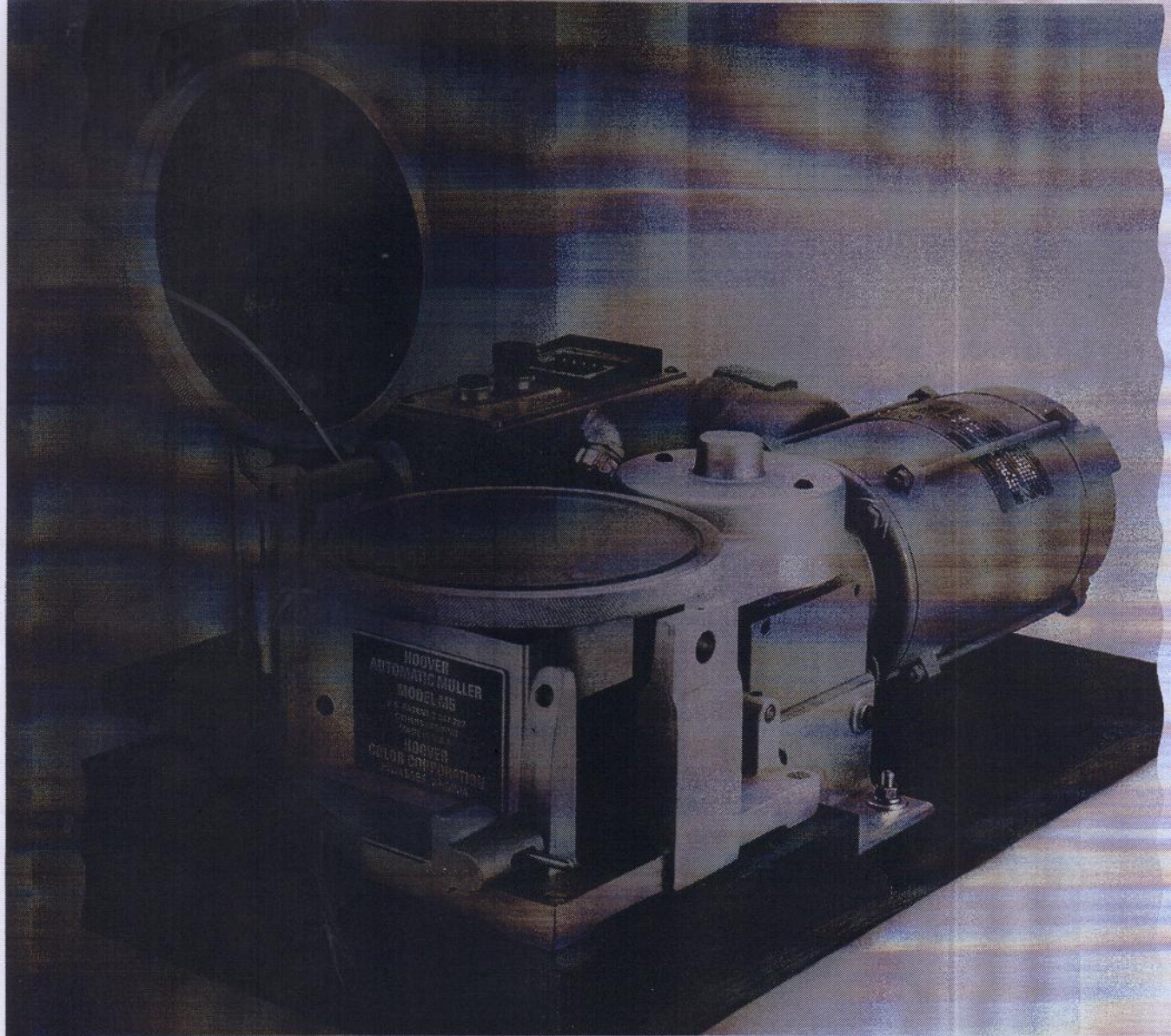
MULLER: Oil ball bearing once per month, also oil center axle through opening immediately above sprocket gear.

CLEANING: CAUTION – WHEN CLEANING, BE SURE TO DISCONNECT CURRENT

GLASS PLATES: Plates are removable by unscrewing retaining rings. It is suggested that to save time, different sets of plates be kept for colors that vary widely in shade. Always have paper circles under glass when replacing. When replacing rings, be sure to put Vaseline or other lubricant on the bevel of the glass and on threads so as to prevent the vehicle from setting up.

DO NOT RUN PLATES DRY.

THE HOOVER AUTOMATIC MULLER



THE SIMPLE TRUTH ABOUT COLOR



HOOVER COLOR
CORPORATION

HOOVER AUTOMATIC MULLER



DESCRIPTION:

The Hoover Automatic Muller is a laboratory pigment dispersing device which provides a quick and easy method for preparing a small pigment-resin sample. As a result of constant rotational speed, uniform pressure, and a precise number of rotations or rubs, duplicate results on repeat tests can be achieved with any given pigment or pigment paste when using the Muller.

MULLER OPERATIONS:

The grinding/dispersing apparatus consists of two glass plates; one stationary and the other rotating. The plates are .375 inches thick when new (.95 cm) and should be replaced when the thickness decreases to 0.365 inches (.93 cm). The diameter of each plate measures 7.75 inches (19.7 cm) and offers a surface quality grade of 3. These plates are secured with aluminum locking rings to ensure secure placement. The operation of this section of the machine is similar to that of a waffle iron, whereby the top plate is lowered onto the bottom and at which point is locked into place. The top plate is connected to the compression bracket which is secured to a weight lever. The weight lever is connected to a stationary weight shaft and supports the grinding weights. Each Muller weight exerts 50 lbs/22.7 kg of force vertically on the top plate. Up to three weights can be used in the Muller, depending on the level of dispersion desired.

The rotating plate is driven by a sprocket chain at 100 rpm. When the plates are closed and the machine is started, the pigment sample and resin are then dispersed together. The action of the rotating plate on the stationary plate shears the pigment into the resin; producing a paint, ink, or other vehicle dispersion.

The rate of dispersion can be altered by six factors including:

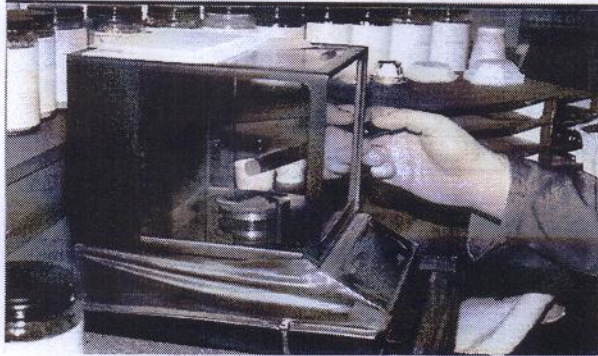
- 1) The type of glass plate used.***
- 2) The number of weights utilized.
- 3) The number of revolutions.
- 4) The viscosity of the vehicle used.
- 5) The solids content of the vehicle used.
- 6) The pigment/vehicle ratio.

*[***Use ground (frosted) glass plates for high-shear dispersion, along with three weights, and a higher number of revolutions to simulate ball mill production. To develop a less intense dispersion or lower shear, use smooth(clear) glass plates, less weight, and a lower number of revolutions to simulate a high-speed disperser.]*

For normal-type applications, grinding should be under 100 lbs of pressure (two weights) and no more than 25 cycles at a time. Do not run dry plates, for it is imperative that the plates be kept wet, especially at the plate's center in order to assure maximum dispersion. In addition, it is critical to maintain a plate thickness of at least 0.365 inches (.365cm) for optimum performance. In the event of small scratches forming on the plate surface, these may be removed using a water-based grinding paste.

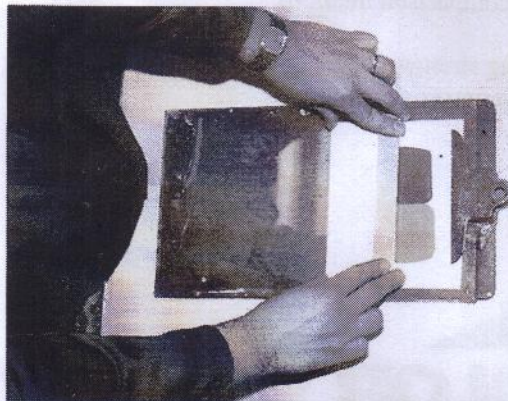
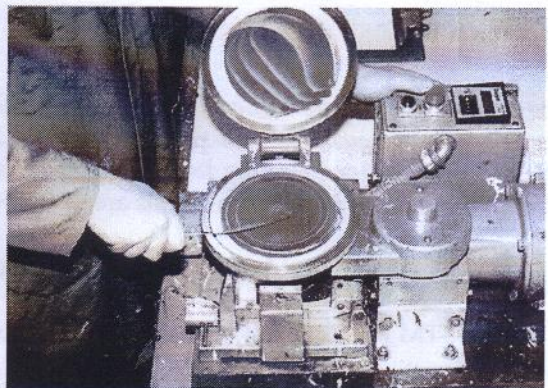
The counter can be manually set for 1 to 99,999 revolutions via push buttons on top. The counter is activated by a start switch and automatically stops when the preset number is reached. The machine can also be deactivated by a stop switch on the machine.

HOW THE MULLER IS USED



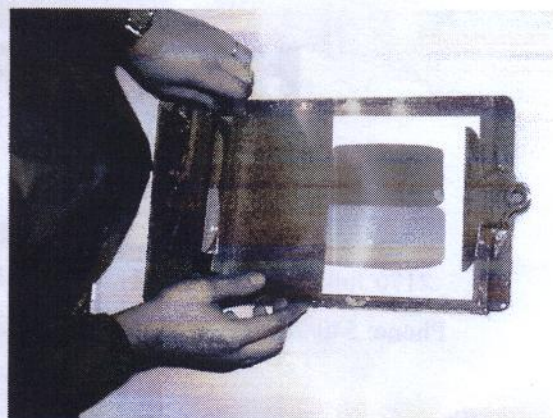
Using an analytical balance, a small sample of pigment is measured out.

The pigment sample, along with a small quantity of vehicle, such as a long-oil alkyd, is mixed together on the Muller. Next, the two glass plates are closed and the Muller is initiated. The pigment is sheared into the vehicle, creating a small sample of paint or ink.



The final paint or ink sample is then draw-down on an appropriate substrate, such as a Drawdown Card. This illustration shows two colors being draw-down together for comparison.

The final drawdown can be evaluated for color properties, either before or after the drawdown is dried, by either visual or instrumental inspection.



MULLER SPECIFICATIONS

The Hoover Automatic Muller comes equipped with a 1/2 HP gearhead, single-phase explosion-proof motor which is available in both 50 or 60 cycle motors as well as 110 or 220 volts. The net weight of this machine measures 110 lbs/50 kg and is sized at 15" wide, 28" long, and 13" height (38x71x33 cm). The Muller comes equipped with two ground (frosted) glass plates, but is also available in smooth (clear) plates for lower shear dispersion.

Replacement parts, including glass plates, are available for purchase from Hoover Color Corporation. Repair and overhaul of the Muller are also available through Hoover Color.

PIGMENT TEST PROCEDURES

PIGMENT TESTING METHODS:

The Hoover Automatic Muller is recommended for the determination of mass color, tint tone, and tint strength of dry pigments and pigment pastes. Specific standardized test methods are published by ASTM; the American Society for Testing Materials and ISO; International Organization for Standardization. The standardized test methods are as follows:

- ASTM D387: Mass color and tint strength of color pigments.
- ASTM D332: Tint strength of white pigments.
- ISO 787-16: Part 16. Determination of tinting strength and color on reduction of colored pigments (Visual comparison method).
- ISO 787-24: Part 24: Determination of relative tinting strength of colored pigments and relative scattering power of white pigments (Photometric methods).

