

MECHANICAL HANDS (PLIERS) FOR ANTHROPOMORPHIC AND CARTESIAN ROBOTS

Mechanical hands (pliers) are pneumatic units for removing manufactured articles (sleeves and bellows) made of rubber from the males, on which they are pressed. Mechanical hands (pliers) can be applied to anthropomorphic robots or manipulators with Cartesian axes. They are composed of a basic, extremely solid structure, on which different tools can be easily fitted with minimum overall dimensions (mechanical fingers or pliers), which are normally used for extracting pieces.

Operation principle: the extraction of manufactured articles is carried out through the movement of the head towards the male part of the mould, from which the article is to be removed. The males of the mould must be in the same position. Special centering pins make sure that the alignment between the blow lips and the mould male part is always accurate.

1 General description of mechanical hands (pliers)

Mechanical hands (pliers) are composed of a basic, extremely solid structure made of aluminium profile, in which different gripping fingers, which are normally used for extracting pieces can be easily fitted with minimum overall dimensions. The fingers handling is carried out by means of a lever device operated by a pneumatic piston. Mechanical hands (pliers) are provided with an air-blow lip to allow the efficient separation of the manufactured article from the male, in order to facilitate its extraction. Mechanical hands can be fixed directly to the wrist of the anthropomorphic robot or to manipulators with Cartesian axes. The coupling is carried out by means of flanges with drillings complying with ISO standards.

The complete equipment of mechanical hands is composed of:

- A pneumatic actuator for handling gripping fingers.
- One or more air-blow lips to blow air between the male and the internal surface of the manufactured article to be extracted.
- Two or more gripping fingers with removable inserts, which can be configured according to the shape of the manufactured article to be extracted.
- An explosion-proof device (pipe) for manufactured articles. On the front side of the pneumatic actuator a sheathing can be applied, which could be single or telescopic, containing the external part of the manufactured article to prevent explosion during air blowing in the extraction phase. For big sleeves the containment pipes are telescopic and can also be adequately unloaded to contain their weight and to create anti-slide grips for the manufactured article during the extraction phase.
- **A device for the ejection of extracted pieces**
- A device for adjusting the closing strength of the gripping fingers. The mechanical hands are provided with a valve for adjusting the closing pressure of the gripping fingers, which allows the fine adjustment of the closing strength without causing any tearing of the manufactured article and at the same time allows to apply the maximum possible strength for the quick removal of the pieces.
- A device for adjusting air-blow pressure for the extraction. The mechanical hands are provided with a valve for adjusting the air-blow pressure, which allows an efficient separation of the manufactured article from the male and facilitates the extraction of the sleeve/bellow.
- A device for applying silicone inside the manufactured article to be extracted. This device for the internal silicone application allows – during the blowing in phases for the breakaway and the extraction of the manufactured article – to atomize some detaching substance in the air being blown in so as to facilitate the sliding of the manufactured article to be extracted.
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- **A device for checking that the pieces extraction has been carried out.** This checking device is normally composed of an optical fibre sensor for each piece to be extracted. Its function is to detect the presence of the piece at the end of the extraction phase, the fall of the piece in the release phase, as well as the starting of a new extraction cycle.
- **A quick connection plug for pneumatic connections.** All pneumatic connections are conveyed into a single quick connection plug to reduce tooling time as much as possible and avoid any connection mistakes.
- A quick connection plug for electrical connections. All electrical connections are conveyed into a single quick connection plug to reduce tooling time as much as possible and avoid any connection mistakes.

MECHANICAL HANDS (PLIERS) USE ADVANTAGES:

- **REDUCED THE TIME OF ITEMS REMOVE**, because it's made at the same time for all the items and not one by one as in a manual removing cycle.
- **REDUCED MANUAL LABOUR:** cycles are completely automated and therefore one operator can control several machines.
- **REDUCED OPEN MOULD TIME**, then smaller moulds cooling and smaller vulcanization time.
- **ELIMINATION OF UNDUE CYCLE STOPS** and their pertinent problems due to moulds cooling down, such as scraps due to insufficient heating, moulds cleaning and eventual removing of them, purges for cleaning the nozzle from prevulcanized material.
- **REDUCED MACHINE DOWN TIME:** it is no longer necessary to wait for the operator to remove moulded items.
- **IMPROVED QUALITY AND CONSISTENCY OF MOULDED ITEMS:** continuous extractor cycles eliminate hazardous open machine down time due to operator absence and/or extraction speed, thus preventing the mould from cooling off and/or the compound from curing in the injection pot and extruder, which may change the physicalchemical properties of the moulded item.
- **THEY PROVIDE A RAPID RETURN ON INVESTMENT.**
- **IMPROVED PLANT OPERATING TIME:** simplifying the machine work load programming, it's really easier to programm, because of costant cycle times.
- **REDUCING LABOR FOR THE TRIMMING OF PIECES:** the use of a mechanical hand consents to automatically remove and separate the burr from the pieces that have been directly pressed during the drawing phase.
- **INCREASING THE NUMBER OF PRESSING OPERATIONS PRODUCED IN THE TIME UNIT:** it is possible to draw the pieces in masked time, that is with closed press during vulcanization, so increasing the number of pressing operations in the time unit.
- **CAREFULLY DRAWING THE COMPLEX AND DIFFICULT PIECES** like curved rubber sleeves for household appliances without affecting the global cycle time because the operation is carried out outside the press in masked time, that is during the vulcanization phase.
- **FINISHING (TRIMMING)** on the machine edge without affecting the global cycle time because the operation is carried out outside the press in masked time, that is during the vulcanization phase.
- **REDUCING THE COST** for drawing heads: the head is built with a minimum number of adequate takes to draw a single raw of pieces and is then used also to draw the pieces that are in the other draws placed on the same male holder bar and on the other bars of the same mould.

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- **REDUCING TOOLING TIME** for production change: it is possible to place more than one drawing head inside the same island; their use can be selected by digiting the reference code in the man-machine dialogue terminal.